

# **VEHICLE RECOGNITION (FRIENDLY ARMOR)**

## **PART II**

Subcourse Number IN0535

EDITION C

United States Army Infantry School  
Fort Benning, Georgia 31905-5593

5 Credit Hours

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### **SUBCOURSE OVERVIEW**

This subcourse is designed to teach you to identify various friendly armored vehicles.

There are no prerequisites for this subcourse.

This subcourse reflects the doctrine that was current at the time it was prepared. In your own work situation, always refer to the latest publications.

The words "he," "him," "his," and "men," when used in this publication, represent both the masculine and feminine genders unless otherwise stated.

### **TERMINAL LEARNING OBJECTIVE**

Action:	Recognize and identify friendly armored vehicles and their capabilities.
Condition:	You will be have the information contained in this subcourse.
Standard:	You will identify friendly armored vehicles and their capabilities according to the material contained in this subcourse.

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## Lesson 1

### TANK IDENTIFICATION

#### OVERVIEW

##### LESSON DESCRIPTION:

In this lesson, you will learn to identify various friendly armored vehicles, including main battle tanks (MBT), medium tanks, and light tanks, and their characteristics.

##### TERMINAL LEARNING OBJECTIVE:

Action:	Identify friendly armored vehicles and their characteristics.
Condition:	You will be given the information contained in this lesson.
Standard:	Identification of friendly armored vehicles and their characteristics will be in accordance with the material contained in this lesson.
References:	The material contained in this lesson was derived from the following publications:  FM 1-402 Jane's Armoured and Artillery 1989-1990.

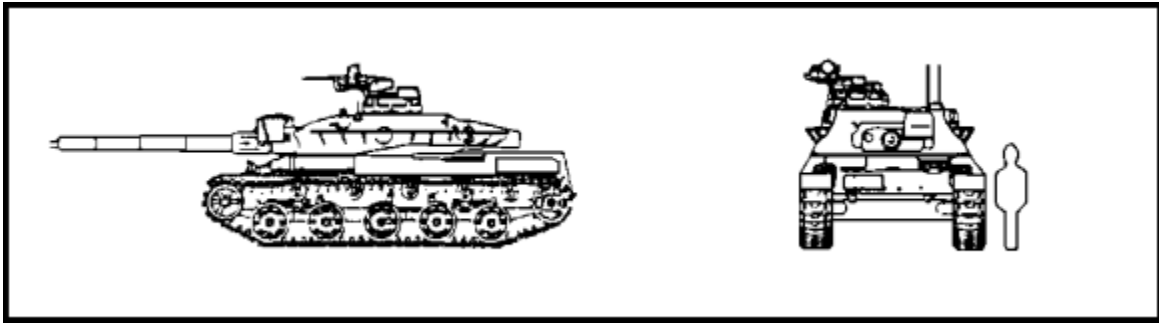
#### INTRODUCTION

The various friendly tanks have distinguishing features, characteristics, and roles. Their capabilities range from high-speed stabilized firing on the move to night-fighting electronics. Most are not amphibious, but are capable of fording several meters of water with the aid of a snorkel or other preparation. Practically all are armed with machine guns and smoke dischargers. Most have main guns that fire new armor-piercing ammunition with great accuracy over thousands of meters. Some have modern add-on armor packages. Variants range from radar-guided missile launchers to bridgelayer, engineer, and recovery vehicles. This lesson will discuss the identification characteristics and capabilities of friendly tanks.

##### 1. Main Battle Tanks (MBT).

There are a number of friendly main battle tanks. They each have individual characteristics and differences in capabilities. This lesson presents information on several MBTs.

- a. AMX 30 Main Battle Tank (Figure 1-1). Produced since 1963 by the French as a replacement for the American M47 tank, the AMX 30 was built with a 12-cylinder multi-fuel engine. The AMX 30 and improved models will remain in service with the French Army until a new main battle tank enters service in the early 1990s. The AMX 30 is easily confused with the former Soviet built T-72 and T-62 tanks.



**Figure 1-1. AMX 30 Main Battle Tank.**

(1) Variants. There are a number of variants of the AMX 30. These are discussed below.

(a) AMX 30S. Developed for desert operations, this model includes the addition of sand shields, and gear reduction that limits speed to 60 kilometers per hour (km/h). The AMX 30S has been adopted by Saudi Arabia and its tanks are fitted with an M409 sight. This has a day sight with a magnification of x8 and an 80 field-of-view. The M409 sight also includes a day sight and an infrared night sight. A laser rangefinder allows the commander to target without traversing the turret. The laser rangefinder also increases the first-round hit probability.

(b) AMX 30 B2. This configuration includes an integrated fire control system based on a laser rangefinder and a low light level television (LLTV) system.

The gunner's telescopic sight is combined with an electronic control system and an optical module containing a computer-controlled graticule. The laser has a maximum range of 10,000 meters. The gunner also has a rotatable periscope, a fixed periscope, and a television (TV) monitor. A computer processes information such as ammunition, drift and jump angles, cross wind velocity, altitude, ambient temperature, target distance, elevation, azimuth, and turret slant. The LLTV camera is mounted externally on the right side of the turret. A TV monitor screen for both the commander and gunner displays an aiming mark for targets up to 1,000 meters.

The B2 can fire the newer armor piercing fin stabilized discarding sabot (APFSDS) ammunition. Different gear boxes and steering allow on-the-spot turning and gear changing in bends. A new suspension gives improved cross-country mobility. Quieter tracks can be fitted as an option. A new pressurization system provides complete filtration for improved nuclear, biological, and chemical (NBC) protection. Other options include longer-life batteries, new filters, a radiation counter, air-conditioning, and different land navigation systems. In place of smoke dischargers, a protection system can fire different types of grenades. An exhaust system smoke generator also can be fitted to the B2 model.

(c) AMX 30 Venezuela. The Venezuelan AMX-30 is modernized with a new fire-control system that has a laser rangefinder, weapon stabilization system, and

sensors for wind, temperature, and humidity. A new diesel engine with fully-automatic transmission increases speed, operating range, and fuel capacity. The commander's and driver's stations were modernized, and the vehicle can lay its own smoke screen by injecting diesel fuel into the exhaust system. Other options include applique armor and replacement of the torsion bar suspension which improves cross-country mobility.

(d) GIAT AMX Super 30. The modernized GIAT AMX Super 30 has improved mobility, firepower, and logistics support. It has a new diesel engine, automatic transmission, and cooling system. Other improvements include a laser rangefinder, halon fire extinguishing system, new turret electric rotary joint, new fuel tanks, improved torsion bars, bump stops, and shock absorbers. Some have an optional thermal camera, slant sensor, and an atmospheric sensor mounted at the back of the commander's cupola.

(e) AMX 30 with GT601. This is a gas-turbine-powered version of the AMX 30.

(f) Super AMX 30. This version has a new, fully automatic transmission and a new diesel that can be removed from the tank in one hour. The Super AMX 30 also has air filtration, cooling and electrical generating systems, new suspension, nuclear, biological, and chemical (NBC) protection system, fire suppression, and increased fuel capacity. A laser fire control system has new stabilized sights for the gunner and commander.

(g) AMX-30D Armored Recovery Vehicle (ARV). Three major tasks are designated for this ARV: recovery of disabled vehicles; replacement of major components such as engines; and engineer work. A hydraulic dozer blade at the front also provides stability while operating the crane or winch. A hydraulic crane mounted on the right of the vehicle can lift up to 15,000 kilograms (kg). The ARV weighs 38,000 kg loaded, and normally carries a spare engine at the rear. The AMX-30D(S) is modified for desert operations.

(h) AMX 30 Bridgelay. This model is not used by the French Army. A few are used in Saudi Arabia. It is basically the AMX 30 with the turret removed and replaced with a scissors-type bridge that can be launched over the rear in five minutes. The bridge opens to 22 meters long and spans a gap up to 20 meters. It is 3.1 meters wide and can widen to 3.92 meters when equipped with widening panels. The vehicle weighs 42,500 kg with the bridge.

(i) Pluton Surface-to-Surface Missile System. This version was a Pluton tactical nuclear missile fitted to the AMX 30 chassis. The missile has a range up to 120 kilometers (km), and can be fitted with a tactical nuclear warhead of either 15 or 25 kilotons.

(j) AMX 30 Combat Engineer Tractor. Also designated EBG for Engin Blinde de Genie, this vehicle is designed for forward areas. A hydraulic dozer blade in front

is fitted with six scarifying teeth. There is a hydraulic winch capable of lifting 20,000 kg. A power take off (PTO) arm can lift obstacles and be fitted with pincers or an auger.

The EBG is armed with a 7.62-millimeter (mm) machine gun, four smoke dischargers, a launching tube for demolition charges, and four anti-tank mine launching tubes. The three-man crew consists of the commander, a sapper and a driver. Maximum speed is 65 kilometers-per-hour (km/h). The fording depth is from 2.5 to 4 meters.

(k) Roland Anti-Aircraft Missile System. This is a modified AMX 30 MBT chassis with two Euromissile Roland surface-to-air missiles in the ready-to-launch position and eight missiles in reserve in the hull, ready for automatic reloading. The surveillance radar is mounted on the turret rear with the tracking radar mounted on the turret front.

(l) Shahine Anti-Aircraft Missile System. This version was developed for Saudi Arabia. It consists of two units. One unit carries six missiles in the ready-to-fire position on a modified AMX-30 chassis. The second unit is the acquisition unit and has a large surveillance radar, also on a modified AMX 30 chassis. This is an all weather system. The firing unit carries no reserve missiles. They must be brought up by a cross-country truck fitted with a crane.

(m) Twin 30-mm Anti-Aircraft Gun System. This version features an AMX 30 chassis fitted with an updated, power operated version of an AMX 13 turret. The turret has twin 30-mm cannons that have 600 rounds ready to fire, and another 900 rounds in reserve. The radar system is mounted on the rear of the turret.

(2) Recognition Features. The AMX 30 has the following features:

- The commander's hatch opens to the rear of a cupola that has all-around vision from 10 periscopes.
- A squared, infrared searchlight is mounted to the left of the main gun.
- There is a sight for the gunner mounted on the roof of the turret, located forward of the commander. The gunner also has two periscopes.
- There is a small, circular loader's hatch on the left rear of the turret.
- Supported track (five support rollers).
- Five road wheels.
- May have side skirts.
- Sides of the hull slope upward toward the center.
- Upper and lower glacis form a rounded edge.
- Air intake covers are on the right side of the front slope.
- Large exposed triangular shaped muffler on each rear hull fender.
- Round engine vent centered on deck at the rear.
- Driver's hatch on the front deck left of the gun tube.
- Long, bell-shaped streamlined turret centered on the hull.

- Smoke grenade dispenser on the turret.
- Bustle rack rails extend from the rear NBC systems box to the front of turret.
- Two round hatches in line on the turret.
- Rectangular main gun mantle.
- Large 105-mm telescopic-shaped gun with heat shield encasing jacket.
- No muzzle brake or evacuator on the long gun tube.
- One 7.62-mm machine gun.
- One 12.7-mm machine gun.
- Large, high profile commander's cupola on the right (with 10 periscopes).

(3) Vehicle Characteristics. The hull has three compartments with the driver in the front, the fighting compartment in the middle, and the engine in the rear. Some key specifications that apply to the AMX 30 are listed below.

#### **AMX 30 Measurements**

<u>Combat Weight</u> , 36,000 kg	<u>Track width</u> , 570mm
<u>Hull length</u> , 6.59 meters	<u>Fuel capacity</u> , 970 liters
<u>Hull width</u> , 3.1 meters	<u>Maximum road range</u> , 500-600 km
<u>Overall height</u> , 2.86 meters	<u>Maximum speed</u> , 65 km/h
<u>Ground clearance</u> , 0.44 meters	

#### **AMX 30 Armor**

<u>Hull Thickness</u>	<u>Turret Thickness</u>
<u>Front</u> , 79mm	<u>Front</u> , 80.8mm
<u>Sides</u> , front, 57mm	<u>Sides</u> , 41.5mm
<u>Top</u> , 15mm	<u>Top</u> , 20mm
<u>Sides, rear</u> , 30mm	<u>Rear</u> , 50mm
<u>Bottom</u> , 30mm	

(4) Vehicle Capabilities. The AMX 30 can

- cross 2.9-meter trench.
- mount a 0.93-meter vertical step.
- climb a 60-percent grade.
- ford 1.3 meters without a snorkel.
- ford 2.2 meters with preparation.
- ford 4 meters with a snorkel.

(5) Armament Characteristics. The following paragraph discusses the AMX 30 main and secondary armament.

(a) Main Armament. The AMX 30 has a 105-mm rifled gun. There is no muzzle brake or fume extractor. Compressed air evacuates fumes from the barrel. The gun is fitted with a magnesium alloy thermal sleeve. The gun can fire APFSDS, high explosive anti-tank (HEAT), high explosive (HE), phosphorus smoke, or illuminating rounds of a French design, and can also fire standard 105-mm ammunition used with the L7 series of weapons used on the Leopard 1 and the M60 series of MBTs. The tank carries 47 rounds (19 in the turret and 18 in the bustle). The 105-mm gun has a maximum effective range of 1,700 meters.

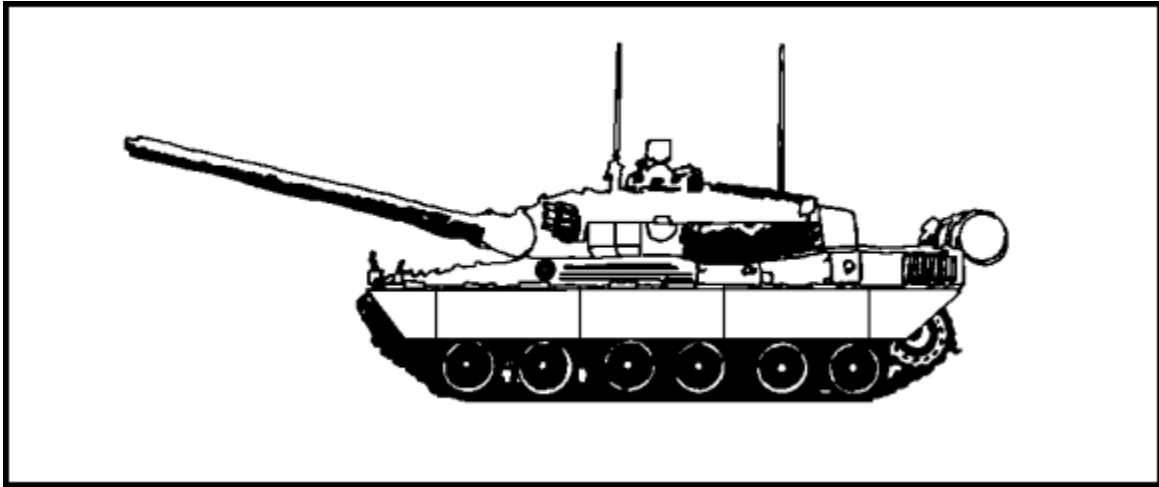
(b) Secondary Armament. The AMX 30's secondary armament consists of the following:

- 20-mm cannon. At the left of the main gun, this cannon can be elevated with the main gun, as well as on its own to a maximum of 40 degrees for use against slow aircraft. It has a range of 1,500 meters and can be fired by the gunner or the tank commander. The cannon fires high-explosive, incendiary (HEI) rounds, armor-piercing rounds, or single-feed M56 type ammunition. 500 rounds are kept at ready use, and 550 rounds are held in reserve.
- 7.62-mm machine gun. This gun is mounted on the right of the commander's cupola, and can be aimed and fired from within the cupola. The machine gun has a maximum effective range with a range of 700 meters. A total of 2,050 rounds is carried, of which 550 are ready for immediate use.
- Smoke dischargers. The smoke dischargers are mounted on either side of the turret, and can lay a smoke screen that can cover the tank in eight seconds.

(6) Countries Served. The AMX 30 tanks are in service with the following countries:

Chile	Iraq	Spain
Cyprus	Nigeria	United Arab Emirates
France	Qatar	Venezuela
Greece	Saudi Arabia	

b. AMX 40 Main Battle Tank (Figure 1-2). The AMX 40 was designed new from the beginning, and was not developed or modified from a previous version. The AMX 40 is powered by a 12cylinder diesel which develops 1,100 horsepower.



**Figure 1-2. AMX 40 Main Battle Tank.**

(1) Variants. The single variant is an AMX 40 armored recovery vehicle. This vehicle has a 25-ton crane and a 35-ton winch.

(2) Recognition Features. The turret is similar to the AMX 30, with the commander sitting on the right, and the gunner forward and below him. The cupola for the commander has eight periscopes for 360-degree observation. On the left side of the cupola roof is a gyro-stabilized sight for target acquisition, observation, and firing the main armament. The loader sits in the left of the turret and has three periscopes and a hatch cover opening to the rear. An ammunition resupply hatch is on the left side. Stowage baskets and the stowage box are located on the sides and rear of the turret. The driver sits on the left and has three forward facing periscopes. The crew has an emergency escape hatch in the hull floor between the driver's seat and turret basket. Other features are:

- Six dual rubber-tired road wheels, idler at the front, and drive-sprocket at the rear.
- Two large drums mounted on the rear of the tank. These are long-range fuel drums that can be jettisoned by the driver, drums carrying an additional seven rounds of 120-mm ammunition, or one of each, depending on the tactical situation.
- One of the prototypes has a sectionalized dozer blade mounted under the nose. It enables the tank to prepare its own fire position, and can be released manually.

(3) Vehicle Characteristics. A 12-cylinder diesel engine and automatic transmission drives the rear sprocket. Armored skirts cover the upper tracks, thicker in the front for lateral protection of the crew compartment. The fire control system is the same as on the AMX 30 B2. The LLLTV camera on the right moves in elevation with the main gun.



The commander and gunner both have a screen for engaging targets up to 2,000 meters away. The gunner also has a x10 sight with laser rangefinder with a maximum range of 10,000 meters. Laminate-type armor provides protection over the frontal arc against infantry antitank weapons and tank rounds up to 100 mm. The skirts over the front four road wheels are much thicker than the remainder to provide later protection for the crew compartment. Standard equipment includes fire extinguishing for crew and engine compartments, NBC package, smoke screen from diesel fuel injected exhaust, and built-in test equipment (BITE). The fourth prototype was designed for hot climates and can operate in temperatures up to 50 degrees Centigrade without any degradation in performance. Specifications for the AMX 40 are provided in the lists and paragraphs that follow.

### **AMX 40 Measurements**

<u>Combat Weight</u> , 43,700 kg	<u>Track width</u> , 570mm
<u>Hull length</u> , 6.8 meters	<u>Fuel capacity</u> , 1,100 liters
<u>Hull width</u> , 3.35 meters	<u>Maximum road range</u> , 550-850 km
<u>Overall height</u> , 3.1 meters	<u>Maximum road speed</u> , 70 km/h
<u>Ground clearance</u> , 0.45 meters	<u>Average road/cross country speed</u> ,55/30-45 km/h

#### **(4) Vehicle Capabilities. The AMX 40 can**

- cross a 3.2-meter trench.
- mount a 1-meter vertical step.
- climb a 70-percent grade.
- ford 1.4 meters without preparation.
- ford 2.3 meters with preparation.
- ford 4 meters with snorkel.

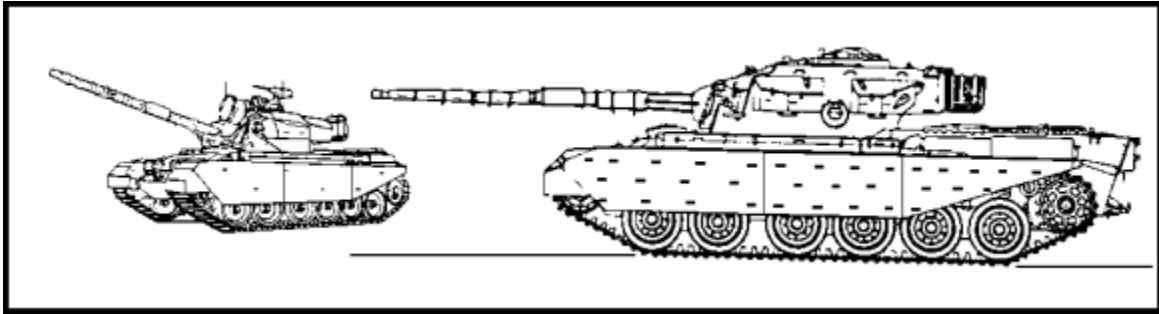
#### **(5) Armament Characteristics. The main and secondary armament of the AMX 40 are discussed below.**

(a) Main Armament. A 120-mm smoothbore gun fires fixed ammunition with a semi-combustible cartridge case. An assisted loading device allows ammunition to be loaded while the tank is moving. The gun can fire APFSDS-T, APFSDS-T (practice), or HEAT multi-purpose rounds, all of which have combustible cartridge cases. The APFSDS-T sub-projectile can penetrate a NATO heavy tank target at a range of 7,000 meters. However, useful combat range is 2,000 meters. The first round hit probability against stationary and moving targets at a range of 2,000 meters is 90 percent. A complete firing engagement takes less than eight seconds.

(b) Secondary Armament. Secondary armament consists of a 20-mm cannon mounted coaxially to the left of the main gun. The 20-mm cannon can elevate independently from -8 to 40 degrees against slow-flying aircraft. A 7.62-mm

machine gun with a white light searchlight is mounted on the right side of the commander's cupola. A bank of three electrically operated smoke dischargers fire forward from either side of the forward turret. As an alternative to smoke dischargers, a protection system can launch a variety of grenades.

c. Centurion Main Battle Tank (Figure 1-3).



**Figure 1-3. Centurion Main Battle Tank.**

The Centurion was designed in 1944 and has undergone many modifications over the years. With a 17-pounder gun, the Mark 1 became uparmored to the Mark 2. A later 20-pounder gun was finally replaced by the 105-mm gun.

(1) Variants. Perhaps more variants of the Centurion have been developed than any other post-World War II tank. Those remaining in service include the Mk 5 with either a 20-pounder or 105-mm gun. Some versions are uparmored or given more fuel capacity. The Mk 6 has infrared night vision equipment, a ranging machine gun, and stowage basket on the turret rear. The Mk 7 is either a 20-pounder with 61 rounds, or a 105-mm version. The Mk 8 has a resiliently-mounted gun mantlet with no canvas cover. Also, the commander can raise his twin hatch covers like an umbrella for better visibility without exposing himself. The Mk 9 is uparmored and upgunned and has versions with night vision equipment and ranging machine gun. The Mk 10 carries 70 rounds of main gun ammunition, and has different versions. The Mk 11, 12, and 13 are upgraded versions of earlier models.

(a) (Mk 5) Bridgelayers. This variant is still used by the Danish Army, but is withdrawn from the British Army.

(b) (Mk 2) Armored Recovery Vehicle (ARV). Still used in small numbers today, the Centurion ARV basically is the tank with the turret replaced by an all-welded superstructure behind the driver's position. A 360-degree commander's cupola has a 7.62-mm machine gun. Spades mounted at the rear of the hull stabilize the vehicle when using the 31,000-kg winch. The vehicle has a crew of four. The loaded weight is 50,295 kg.

(c) (Mk 5) Assault Vehicle Royal Engineers (AVRE). This is basically the Mk 5 tank with the gun replaced by a 165-mm demolition gun, and a hydraulic dozer

blade mounted in front. The AVRE can be fitted with a track-width mine clearing plough. It may tow a trailer carrying mine clearance equipment. The vehicle has a crew of five. It weighs 51,810 kg loaded. It is used only by the British Army. There are also some versions which have a 105-mm gun instead of the 165-mm gun.

(d) BARV. This vehicle is used only by the British Army. Only 12 were built for use by amphibious forces. It is basically a Centurion tank with its turret replaced by a superstructure that enables it to operate in water up to 2.895 meters deep. It has a crew of four, one of whom is a trained diver. Loaded weight is 40,643 kg.

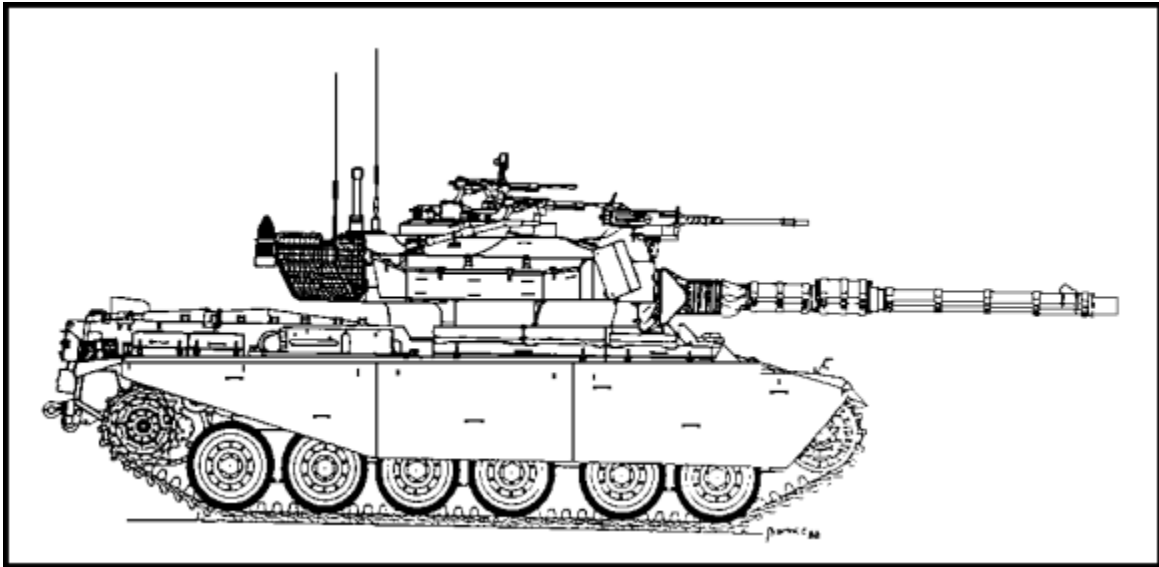
(e) Austrian Centurions. Austria uses the Centurion 105-mm in static defense roles.

(f) Danish Centurions. The Danish Centurions have been upgunned to the 20 pounder or the 105-mm gun. They also have a 12.7-mm machine gun mounted forward of the commander's cupola.

(g) Israeli Centurions. One of the main drawbacks of the Centurion was the gasoline engine which provided a low power-to-weight ratio and poor fuel economy. Israel modified the Centurion to incorporate a diesel engine. To accommodate the new engine, the rear of the hull was enlarged. The modified Israeli Centurions are recognized by the raised engine decks and air filter boxes on the track guards. The upgraded vehicles have increased fuel capacity and improved ammunition layout, with 72 rounds of 105-mm ammunition. Some have a 12.7-mm machine gun over the main gun barrel. The 12.7-mm gun is fitted with one box of ready use ammunition and is fired by an electrically operated solenoid from within the turret. The upgraded Centurion has a maximum road speed of 43 km/h and twice the cruising range of the Centurion Mk 5 on which it was based.

Many Israeli Centurions are fitted with a track-width mine plough or a mine-clearing roller system. For use as armored personnel carriers, some Israeli Centurions have their turrets removed, have machine guns mounted around the top, and may be armed with light mortars. A 290-mm multiple rocket system also has been mounted on a Centurion chassis. The upgraded Centurion can also be fitted with a dozer attachment, which can be installed by the tank crew in about 30 minutes.

[Figure 1-4](#) shows a recent version of Sho't Upgraded Israeli Centurion fitted with Blazer explosive reactive armor, roof mounted mortar, two 7.62-mm machine guns on the roof, 12.7-mm machine gun over the 105-mm gun, thermal sleeve for the 105-mm gun, new low visibility antennas, new exhaust ports, different stowage basket at the hull rear, and Matador computerized fire-control system.



**Figure 1-4. Sho't Upgraded Israeli Centurion.**

(h) Jordanian Centurions. The Jordanian Army refitted its 293 Centurions with diesel engines, laser rangefinders, turret drives, stabilization systems, and hydropneumatic suspensions.

(i) South African Centurions. South Africa modernized about 300 Centurions. These modified Centurions are known as Olifant, or Elephant. Each is fitted with a V-12 diesel engine, automatic transmission, a South African manufactured 105mm L7A1 gun, and a bank of six 81-mm dischargers on each side of the turret. South Africa has also developed an ARV based on the Centurion MBT chassis.

(j) Swedish Centurions. Sweden upgraded its Centurions with solid-state, computerized gun-control equipment, laser rangefinder and a 71-mm twin launcher illuminating system with a 1300 meter range. The cupola was modified to include an armored hood for the commander when observing head out. A 7,000kg Swedish mine clearing roller system can be fitted in 30 to 40 minutes for use at slow speed.

(2) Recognition Features. The Centurion has the following features:

- Supported full tracks.
- Six pressed road wheels with a gap between number 2 and number 3.
- Large side skirting plates angle-cut at the rear, covering the support rollers but completely exposing the number 6 road wheel.
- Wedge shaped glacis plate inset between the tracks.
- Upper and lower front glacis forms a straight edge.
- Tow hooks mounted at the edge of the front glacis.
- Two large mufflers on each side of the rear deck.

- Some upgraded diesel versions have air cleaner boxes just forward of where the mufflers were.
- Engine vents centered on the rear deck.
- Driver's split hatch on the right front of the hull.
- Large, square turret centered over the third and fourth road wheels.
- Wire storage box mounted on the rear of the turret.
- Long stowage boxes along the fenders on each side.
- One large angular stowage box on the right side of the turret.
- Two angular stowage boxes on the left side of the turret.
- Smoke launchers on both sides of the turret.
- 105-mm main gun.
- One 12.7-mm machine gun.
- One 7.62-mm machine gun.
- Bore evacuator two-thirds the distance from the muzzle.
- Large, square gun mantle.
- Commander's hatch is slightly raised on the right side of the turret.

(3) Vehicle Characteristics. The driver sits at the front right side, with two hatch covers opening to either side, each with a periscope. The casted turret has a welded roof. An ammunition resupply hatch is on the left.

The loader sits inside of the turret on the left side, the commander on the right, and the gunner below and in front. The commander's cupola has split hatches, a periscope sight with a ballistic pattern, and seven periscopes for all-around observation. A searchlight is mounted at the commander's station. Below that is a periscope sight for the gunner. The loader has a single observation periscope and twin hatch covers that open front and rear.

The engine compartment is separated by a fireproof bulkhead. Drive sprockets are at the rear. There are six track-return rollers, four that are dual rollers in the center. Cast manganese steel tracks are covered by removable skirts that help protect against HEAT projectiles.

Many Centurions were fitted with infrared driving lights, searchlight, and sights. There is no NBC system or deep-fording capability, although a kit was developed. To clear obstacles or prepare fire positions, a dozer blade may be mounted in front. A mono-wheel trailer full of fuel may be towed to increase its otherwise short operational range.

All models up to the Mark 10 use the same basic rear engine and transmission, but some have improved fuel capacity, contra-rotating commander's cupola and stowage. The Centurion also has these features:

## Measurements

Combat Weight, 50,728 kg to 51,820 kg

Track, 2.641 meters

Hull length, 7.55 meters to 7.823 meters

Track width, 610 mm

Hull width, 3.39 meters

Track length on ground, 4.572 meters

Overall height, 2.94 meters to 3.009 meters

Fuel capacity, 458 liters to 1,037 liters

Ground clearance, 0.457 meters to 0.51 meters

Maximum road range, 102 km to 190 km

Maximum road speed, 34.6 km/h

## Armor

### Hull Armor Thickness

Hull glacis, 76mm to 108mm

Hull nose, 76mm

Hull sides front, 51mm

Hull sides, rear upper, 38mm

Hull sides, rear lower, 20 mm

Hull floor, 17mm

### Turret Armor Thickness

Turret Front, 152mm

(4) Vehicle Capabilities. The Centurion MBT can

- cross a 3.352-meter trench.
- mount a 0.914-meter vertical step.
- climb a 60-percent grade.
- ford 1.45 meters.
- ford 2.74 meters with preparation.

(5) Armament Characteristics. The two levels of armament (main and secondary) are discussed in the following subparagraphs.

(a) Main Armament. The 105-mm rifled gun with fume extractor is the main armament of the Centurion Mk 13. Many countries fitted the gun with a thermal sleeve. Effective range is 1,800 meters with armor piercing discarding sabot (APDS), or between 3,000 and 4,000 meters with the high explosive squash head (HESH). A well-trained crew can fire eight rounds per minute. The gun fires APDS-T (L28A1), APDS-T (L52A1), APFSDS-T, DS/T, HESH, and smoke ammunition manufactured by Royal Ordnance. It also fires ammunition manufactured by many other countries such as, Austria, Canada, France, West Germany, Israel, and the USA.

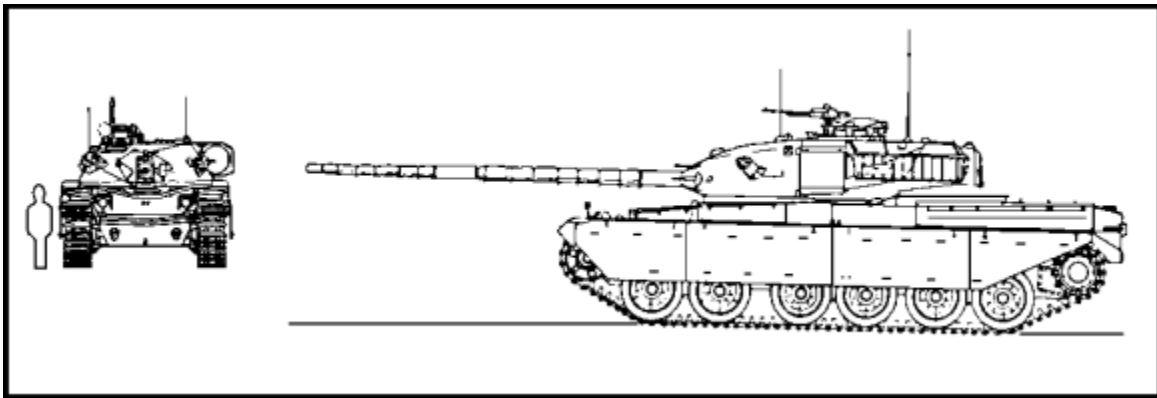
(b) Secondary Armament. A 12.7-mm ranging machine gun is mounted coaxially to the main gun. It has a range up to 1,800 meters, and fires in three-round bursts using tracer ammunition. A 7.62-mm machine gun is mounted to the left of the

main gun, and another is mounted on the commander's cupola for anti-aircraft use.

(6) Countries Served. Centurion tanks are in service with the following countries.

Austria	Kuwait	Sweden
Denmark	Singapore	United Kingdom (no MBTs, only ARVs, AVREs, and BARVs)
Israel	Somalia	
Jordan	South Africa	

d. Chieftain Main Battle Tank ([Figure 1-5](#)). Somewhat similar to the earlier Centurion, the Chieftain was designed with a new turret without mantlet. The driver is seated reclining at the front of the hull to reduce height.



**Figure 1-5. Chieftain Mk 3 Main Battle Tank.**

(1) Variants. A number of modifications and variations of the Chieftain are presented in the following subparagraphs.

(a) Chieftain with Stillbrew Armor. In 1986 some Chieftains were fitted with a substantial increase in armor protection with little degradation in automotive performance. No details of the actual Stillbrew have been released, but it is probably an outer shell of steel with layers of composite armor behind. It is fitted over the front of the turret and hull top to the rear of the driver's position to give more protection to the generally vulnerable gap between hull and turret.

(b) Chieftain Assault Vehicle Royal Engineers (AVRE). The Assault Vehicle Royal Engineers (AVRE) was a conversion done in Germany. The turret is replaced by a metal plate that mounts a set of rails that carry rolls of trackway. The rails can also carry other combat engineering stores or a spare bridge for the armored vehicle-launched bridge (AVLB). The AVRE has a crew of three. It has a dozer blade that can be fitted with mine ploughs. There is no provision for a demolition gun as is fitted on the Centurion AVRE.

(c) Armored Repair and Recovery Vehicle (ARRV). The Chieftain ARRV has a hydraulic crane that can lift the complete powerpack of the new Challenger MBT.

(d) Chieftain Armored Recovery Vehicle. This ARV uses electro-hydraulic controls on the main double capstan winch with 122 meters of 28-mm diameter cable. A similar auxiliary winch provides 260 meters of 11-mm cable. Power comes off the main engine. A hydraulic earth anchor is lowered to allow the vehicle to exert a pull of up to 90,000 kg. Chieftains delivered to Iran had a 5,803-kg crane. The ARV has a 7.62-mm machine gun and smoke dischargers.

(e) Chieftain Mk 6 Armored Vehicle-Launched Bridge (AVLB). The Chieftain turret was replaced by an armored roof plate with a commander's hatch and hydraulic bridge-launching mechanism. Mounting points are included for a track-width mine plough system.

(f) Chieftain Armored Vehicle-Launched Bridge (AVLB). This is basically a Chieftain without a turret, and with hydraulics to lay and recover a tank bridge. Either a 24.384 meter or 13.411-meter bridge is carried folded and is launched over the front.

(g) Chieftain 155-mm Self-Propelled Gun (SPG). This is a 155-mm turret on a Chieftain chassis.

(2) Recognition Features. Main features of the Chieftain are:

- Supported full track.
- Six pressed road wheels.
- Sixth road wheel not fully exposed by the track skirting.
- Side skirts angled sharply at the rear.
- Flat, low-silhouetted hull.
- Curved shaped front glacis.
- Splash board set well forward.
- High, flat, rectangular engine vents centered on the rear deck.
- Long stowage boxes on each side at the rear of the hull.
- Stowage boxes on front fenders (tapered, giving a built-in streamlined appearance).
- One round and one square hatch in line.
- Driver's hatch is centered on the front deck under the gun tube.
- U-shaped ballistic shield surrounds the driver's compartment.
- Pointed nose turret without mantlet and with a long sloping front.
- Large, oval, shallow turret with a large overhang.
- Turret longitudinally centered over the fourth road wheel.
- Large bustle racks on each side at the rear of the turret.
- Large 120-mm main gun with thermal dispensing covers.
- Very long gun protrudes from the center of the turret.



- Bore evacuator one-third the distance from the muzzle.
- Large searchlight built into the left side of the turret.
- One 12.7-mm machine gun.
- Two 7.62-mm machine guns.

(3) Vehicle Characteristics. The driver's hatch opens to the right. Behind his hatch is a periscope with optional infrared night driving capability. The turret is made of cast and rolled steel sections. The loader is on the left and the commander and gunner on the right.

The commander's cupola has nine observation periscopes and one sighting periscope. To the right of the cupola is a spotlight operating coaxially with a machine gun. On the turret roof is an infrared detector that has three silicon photo-voltaic cells covering 360 degrees. This can localize any infrared light source within an arc of 62 degrees. The gunner is below the commander and has either a sight periscope or a laser sight unit. He also has a telescopic sight. The gunner and commander can be equipped with infrared night sights. The loader has a folding, rotatable periscope and a two-piece hatch cover opening to the front and back.

A very high-intensity infrared/white light searchlight is mounted on the left side of the turret. The searchlight overhangs the side of the turret and has an armored cover. The searchlight uses a servo-control system on the mirror assembly. It has an infrared range of 1,000 meters, and white-light range of 1,500 meters. However, the searchlight is being replaced by the British Army with the smaller thermal observation and gunnery sight (TOGS) unit. The thermal imager moves with the main gun.

The Chieftain can be fitted with a navigational aid. Some have a dozer blade with an electro-hydraulic power pack fitted in place of the right front stowage bins. The driver operates the aluminum blade with a joystick control.

The NBC system is located on the turret bustle. A ventilation and filtration system in the rear of the turret provides clean air and works with the NBC filter pack so the crew does not have to wear respirators inside the tank. An automatic fire-detection system sounds a horn, flashes indicators, and sounds signals in the crew's headsets. There are five portable fire extinguishers.

Other characteristics are:

### **Measurements**

Combat Weight, 54,100 kg

Track width, 610 mm

Hull length, 7.52 meters

Fuel capacity, 950 liters

Hull width, 3.5 meters

Maximum road range, 400 to 500 km

Overall height, 2.895 meters

Maximum cross country range, 200 to 300 km

Ground clearance, 0.508 meters

Maximum road speed, 48 km/h

Track, 2.718 meters

(4) Vehicle Capabilities. The Chieftain can

- cross a 3.149-meter trench.
- mount a 0.914-meter vertical step.
- climb a 60-percent grade.
- ford 1.066 meters.

(5) Armament Characteristics. An improved fire control system (IFCS) significantly improves first-round hit probability on stationary tank targets of at least 3,000 meters and on moving targets at more than 2,000 meters.

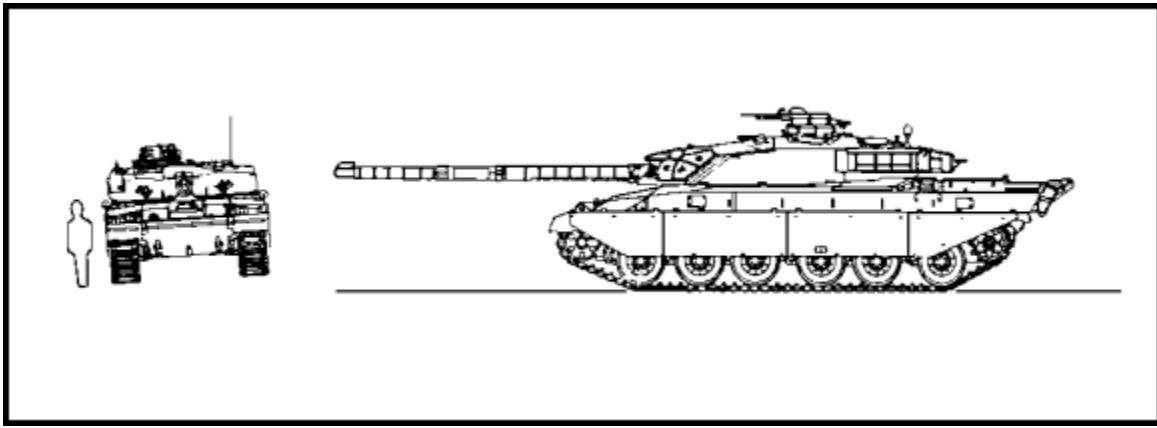
(a) Main Armament. A 120-mm rifled tank gun has a fume extractor, muzzle reference system, thermal sleeve, and vertical sliding breech block. The main gun can fire at a maximum rate of 8 to 10 rounds for the first minute, followed by 6 rounds per minute. Separate loading ammunition consists of charges stored in pressurized bins below the turret ring, and projectiles stowed alongside the driver, under the gun, and in the turret. The Chieftain carries 53 to 64 rounds of ammunition for the main gun, depending on the version of the tank. Maximum effective range is 3,000 meters.

(b) Secondary Armament. A 12.7-mm ranging machine gun (RMG) originally was the main means for aiming the main gun. Mounted coaxially to the main gun, short bursts from the RMG landing over the target provided quite rapid engagement by indicating main armament graticule marks to use. The main gun is not fired until virtually certain of a hit. The RMG and its ammunition was removed when fitted with the IFCS. The IFCS is used only in British Army Chieftains. A 7.62-mm machine gun is mounted to the left of the main gun. Another 7.62-mm machine gun on the commander's cupola can be aimed and fired from within the tank.

(6) Countries Served. Chieftain tanks are in service with the following countries:

Iran	Kuwait
Iraq	Oman
Jordan	United Kingdom

e. Challenger Main Battle Tank (Figure 1-6). The Challenger is essentially a modified Shir 2, which was built for Iran. It is fitted with Chobham laminated armor, a 1200 hp diesel engine, automatic transmission, and improved fire control system (IFCS). The British Army has seven Challenger regiments.



**Figure 1-6. Challenger Main Battle Tank.**

(1) Variants. The Challenger variants are discussed below.

(a) Challenger Armored Repair and Recovery Vehicle (CR ARR). These vehicles have a hydraulic winch, independent auxiliary winch, and hydraulically-operated crane to lift a complete Challenger powerpack. A multi-purpose blade in the front can be used as an earth anchor, dozer blade, or crane stabilizer.

(b) Marksman Anti-Aircraft Turret. A twin 35-mm anti-aircraft turret has been mounted on a Challenger and successfully tested.

(2) Recognition Features. The Challenger is characterized by:

- Supported full track; drive sprocket in rear.
- Six aluminum road wheels (space between third and fourth road wheels); four return rollers.
- Side skirts angled sharply at rear, partially exposing sixth road wheel.
- Skirt covers upper track similar to Chieftain.
- Square/angled, box shaped hull.
- Hull armor is streamlined with flat surfaces.
- Upper and lower glacis form a straight edge.
- Driver compartment recessed into the center of the upper glacis.

- Large angular, faceted turret with sloped front, flat on top.
- Center-mounted turret and fighting compartment.
- Five smoke dischargers on each side of the front of the turret.
- Small bustle racks located at each rear turret corner.
- NBC environmental control system mounted at the turret rear.
- No gun mantle.
- Long 120-mm main gun with thermal jacket and muzzle reference system (MRS) collimator.
- Bore evacuator located 1/3 back from the muzzle.
- Gunner primary sight recessed into the right front turret roof.
- One 7.62-mm machine gun mounted coaxially.
- One 7.62-mm machine gun mounted on commander's cupola.

(3) Vehicle Characteristics. The Challenger has a similar layout as the Chieftain. The driver's compartment is at the front, the turret and fighting compartment in the center, and the engine and transmission at the rear. The driver has a single-piece hatch cover that lifts and swings forward horizontally for driving with his head out. He can also exit through the fighting compartment. Behind the driver's hatch is one wide-angle periscope. The commander sits on the right of the turret, behind and above the gunner. The loader is to the left.

The commander's cupola either has a day sight or an image intensification swap sight. The cupola has nine periscopes for all-around viewing. A Thermal Imaging Surveillance and Gun Sighting Sight (also TOGS, for Thermal Observation and Gunnery Sight) is located in an armored box on the right of the turret, and can separately serve the commander and gunner. The loader has a periscope swivel-mounted on the roof forward of a two-piece hatch that opens front and rear. The Challenger has a four man crew. Applicable specifications are provided in the lists and paragraphs that follow.

### **Measurements**

<u>Combat Weight</u> , 62,000 kg	<u>Track</u> , 2.12 meters
<u>Hull length</u> , 8.33 meters	<u>Track width</u> , 650mm
<u>Hull width</u> , 3.5 meters	<u>Fuel capacity</u> , 1797 liters
<u>Overall height</u> , 2.95 meters	<u>Maximum road speed</u> , 56 km/h
<u>Ground clearance</u> , 0.5 meters	

(4) Vehicle Capabilities. The Challenger can

- cross a 2.8-meter trench.
- mount a 0.9-meter vertical step.
- climb a 58-percent grade.
- ford 1.07 meters.

(5) Armament Characteristics. The characteristics of the main and secondary armament are discussed below.

(a) Main Armament. The main gun is a 120-mm gun fitted with a thermal sleeve, fume extractor, and a muzzle reference system. It can fire APDS-T (L15A4), DS-T (L20A1), HESH (L31), HESH practice (L32A5), smoke, white phosphorous (WP) (L34), and APFSDS-T (L23A1) ammunition. There are up to 42 charge stowage and 64 projectile stowage positions. Each charge location takes either one DS charge or two HESH or smoke charges. A typical mix would be 20 DS and 44 HESH or smoke.

(b) Secondary Armament. There is one 7.62-mm machine gun mounted coaxially with the main gun. Another 7.62-mm machine gun is mounted on the commander's cupola. There is a cluster of five smoke dischargers on each side at the front of the turret.

(6) Countries Served. United Kingdom. The British Army has 420 Challengers. It has been tested in Abu Dhabi, and demonstrated in Morocco, but no export sales have been made.

f. Khalid Main Battle Tank. The Khalid is essentially the Shir 1 with minor modifications and is based on a late production Chieftain with major changes in the fire control system and the powerpack.

(1) Recognition Features. The Khalid is somewhat of a cross between similar turret characteristics of the Chieftain, and the heavy hull of the Challenger. Additional stowage boxes may be mounted on the right side of the track guard. Main features are:

- Fully tracked.
- Six road wheels.
- Armored skirting covering upper track.
- Flat, low-silhouetted hull with large, oval turret longitudinally centered over fourth road wheel.
- Large main gun with thermal sleeves and muzzle reference system.

(2) Vehicle Characteristics. The Khalid and the Challenger have almost identical powerpacks. The fire control system of the Khalid is the Computer Sighting System which is similar to the Chieftain IFCS. The Khalid also has a laser tank sight. The commander's cupola has a combined day/passive night sight plus projector reticle image unit. The commander has 24-hour day/night vision and firing capability. Some key specifications are:

## Measurements

Combat Weight, 58,000 kg

Hull length, 8.39 meters

Hull width, 3.518 meters

Overall height, 3.012 meters

(3) Armament Characteristics. The main and secondary armament of the Khalid are discussed below.

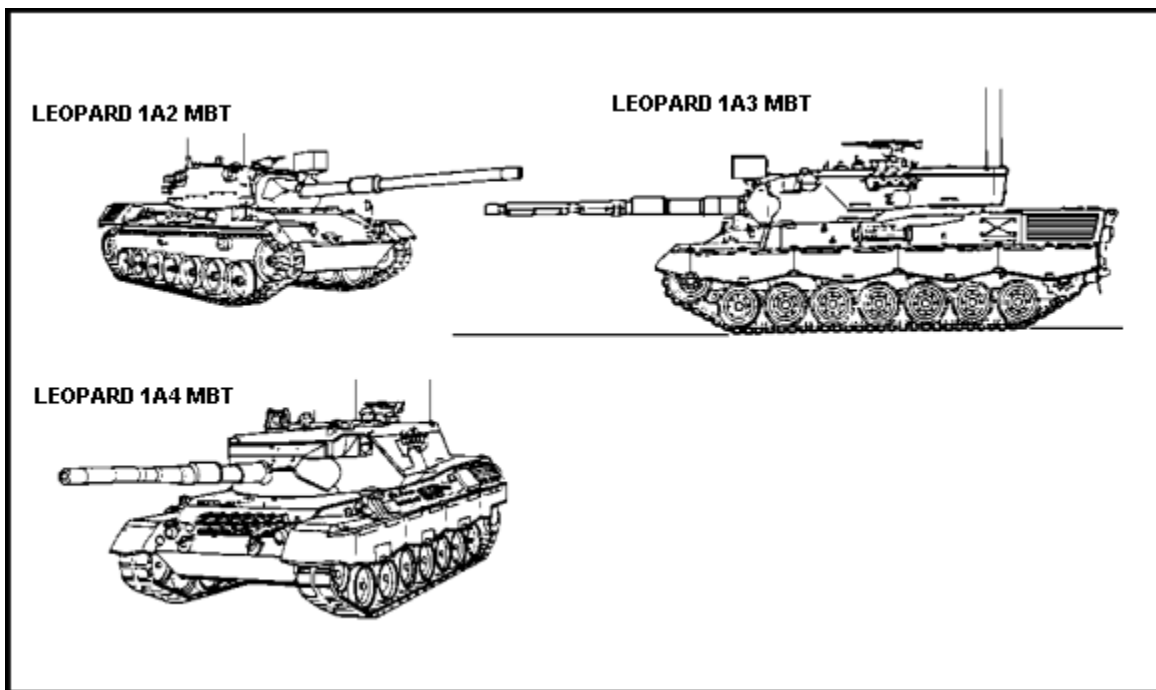
(a) Main Armament. The main gun is a standard 120-mm rifled tank gun.

(b) Secondary Armament. The Khalid also is armed with 7.62-mm machine gun mounted coaxially with the main gun, another 7.62-mm machine gun that can be aimed and fired from inside the commander's cupola, and six smoke dischargers on each side of the turret.

(4) Countries Served. Jordan ordered 274 Khalid main battle tanks from the United Kingdom for delivery beginning in 1981. Production is complete, and they are in service with the Jordanian Army.

g. Leopard 1 Main Battle Tank (Figure 1-7). The Leopard 1 was developed by West Germany and has been exported in several versions to several armies in the world.

(1) Variants. The several variants of the Leopard 1 are discussed in the following subparagraphs.



**Figure 1-7. Leopard 1 Main Battle Tank.**

- (a) Leopard 1A1A1. Many of the Leopard 1 became the Leopard 1A1 when fitted with a main gun thermal sleeve, stabilization system, and new tracks and skirts. The stabilization system gives a higher first-round hit probability by controlling elevation and traverse to acquire and engage the target while moving across country. They became the Leopard 1A1A1 when fitted with additional armor made of rubber-lined steel plates screwed on the turret, gun shield, and turret bustle back. More steel plates were welded on the sloped front roof section.
- (b) Leopard 1A2. This version has a stronger cast steel turret, an improved NBC system, and image-intensification night vision for the commander and driver.
- (c) Leopard 1A3. This incorporates a new welded turret with a wedge-shaped mantlet. A contoured rear turret stowage bin holds the searchlight when it is not mounted over the main gun. The loader's periscope is movable in elevation and azimuth.
- (d) Leopard 1A4. This version has an integrated fire control system consisting of a commander's stabilized panoramic telescope and a gunner's primary sight with stereoscopic rangefinder coupled to a fully-stabilized main gun and ballistic computer.
- (e) Australian Leopards. The Australian Leopards are the 1A3 model fitted with the Belgian SABCA fire control system and a tropical kit. Leopards replaced the Centurions in the 1st Royal Australian Armoured Regiment.
- (f) Belgian Leopards. The Belgian vehicles had their MG3 machine guns replaced by FN 7.62-mm weapons and some minor storage changes.
- (g) Canadian Leopards. The Canadians selected a modified version of the Leopard 1A3 fitted with the Belgian fire control system to replace their Centurion tanks.
- (h) Greek Leopards. The Greek Leopards have the EMES 12A3 fire control system and an LLLTV system.
- (i) Netherlands Leopards. The Dutch Leopards have different radios, Dutch type smoke dischargers, and three stowage panniers. They are fitted with the same applique turret armor as is on the Leopard 1A1A1. The Dutch Leopards use the British L52 APDS round for the main gun.
- (j) Norwegian Leopards. Like the Netherlands, the Norwegians use the British L52 APDS round. All Norwegian Leopards are being upgraded to Leopard 1A3 standards, but will retain the cast turret.
- (k) Turkish Leopards. The Turkish Leopards are 1A3s with the EMES 12A3 fire control system and an LLLTV system.
- (l) Leopard Armored Recovery Vehicle. The ARV has a tank chassis with a new hull. Standard equipment is a dozer blade, hydraulic crane pivoted on the front

right of the hull, a 35-ton winch, electric winch, and welding system. With a crew of four, the ARV recovers and tows damaged or disabled vehicles. It can lift complete vehicles or components up to 20 tons. It carries a spare powerpack, dozing equipment, and refueling equipment. The ARV is armed with two 7.62-mm machine guns, one for anti-aircraft defense, and smoke dischargers.

(m) Leopard Armored Engineer Vehicle (AEV). The AEV is based on the ARV. The only differences are that the AEV has a heat exchanger, explosives are carried for demolition work, an auger is carried in place of the spare powerpack on the rear, and the dozer blade can be fitted with scarifiers.

(2) Recognition Features. The Leopard 1 MBT has the following features:

- Supported, fully tracked (three support rollers).
- Seven evenly spaced, pressed road wheels.
- Jagged or wavy design track skirting.
- One 105-mm gun with no muzzle brake.
- Bore evacuator two-thirds the distance from the muzzle.
- Large wedge-shaped gun mantle.
- May have a thermal shroud.
- One 7.62-mm machine gun mounted coaxially with the main gun.
- One 7.62-mm machine gun mounted on the turret roof.
- Elongated or oval, slab-type, all-cast turret mounted forward of center.
- Turret has an external stowage basket in the rear.
- Sides of the hull slope upward toward the center.
- Sloped front armor.
- Upper and lower glacis form a straight edge.
- Louvered exhaust grills on the rear of the hull sides.
- Engine plate in the rear angles up the from the turret.
- One rectangular louvered engine vent on each side at the rear.
- One postage stamp engine vent centered on the rear deck.
- One rounded and one oval hatch in line on the turret.
- Driver's hatch on the front deck at the right of the gun tube.
- Box-shaped searchlight (if mounted) above and to the left of the gun.
- Leopard 1A2s have round turrets.
- Leopard 1A3s and 1A4s have angular, box-shaped turrets.

(3) Vehicle Characteristics. The hull has two compartments. The engine is at the rear and separated from the crew by a fireproof bulkhead. The driver is in the front on the right and has a hatch cover opening to the left. In front of his hatch are three periscopes, one that can be infrared or image-intensification for night driving.

The commander and gunner sit on the right and the loader on the left of an all-cast turret. Hatch covers open to the rear for both the commander and gunner. Eight periscopes for all-round observation are provided for the commander. Sights and one periscope are at



the gunner's station, while the loader has two periscopes. In the turret roof in front of the commander's hatch is a swivel-mounted x6 to x20 zoom periscope. The gunner, seated in front of and below the commander, has a rangefinder and a telescope mounted coaxially with the main gun.

On the left side of the turret is an ammunition resupply hatch. Many models have a stowage basket at the turret rear. A searchlight sits over the main gun, but is sometimes removed and stowed at the back of the turret. The infrared range is 1,200 meters and the white light range is 1,500 meters. An LLLTV observation and sighting system is on the Leopard 1A1A2. Other highlights are:

### **Measurements**

<u>Combat Weight</u> , 40,000 to 42,400 kg	<u>Track</u> , 2.7 meters
<u>Hull length</u> , 7.09 meters	<u>Track width</u> , 550mm
<u>Hull width</u> , 3.25 to 3.41 meters	<u>Track length on ground</u> , 4.236 meters
<u>Overall height</u> , 2.613 to 2.764 meters	<u>Fuel capacity</u> , 955 liters
<u>Ground clearance</u> , 0.44 meters	<u>Maximum road range</u> , 600 km
	<u>Maximum cross country range</u> , 450 km
	<u>Maximum road speed</u> , 65 km/h

### **Armor**

<u>Hull Armor Thickness</u>	<u>Turret Armor Thickness</u>
<u>Hull nose</u> , 70mm	<u>Turret mantlet</u> , 60mm
<u>Hull glacis</u> , 70mm	<u>Turret front</u> , 52mm
<u>Hull glacis top</u> , 25mm	<u>Turret sides</u> , 60mm
<u>Hull sides upper</u> , 35mm	<u>Turret rear</u> , 60mm
<u>Hull sides lower</u> , 25mm	
<u>Hull top</u> , 10mm	
<u>Hull floor</u> , 15mm	
<u>Hull rear</u> , 25mm	

(4) Vehicle Capabilities. The Leopard 1 can

- cross a 3-meter trench.
- mount a 1.15-meter vertical step.
- climb a 60-percent grade.
- ford 2.25 meters.
- ford 4 meters with preparation.

(5) Armament Characteristics. The Leopard 1 main and secondary armament are discussed below.

(a) Main Armament. The main gun is a British-supplied 105-mm rifled tank gun with a single-piece barrel. It has a screwed-on breech ring and bore evacuator. The barrel can be changed in the field in 20 minutes. After each round is fired, a semi-automatic breech mechanism opens, ejecting the empty cartridge case into a container under the breech. Maximum effective range is 2,400 meters.

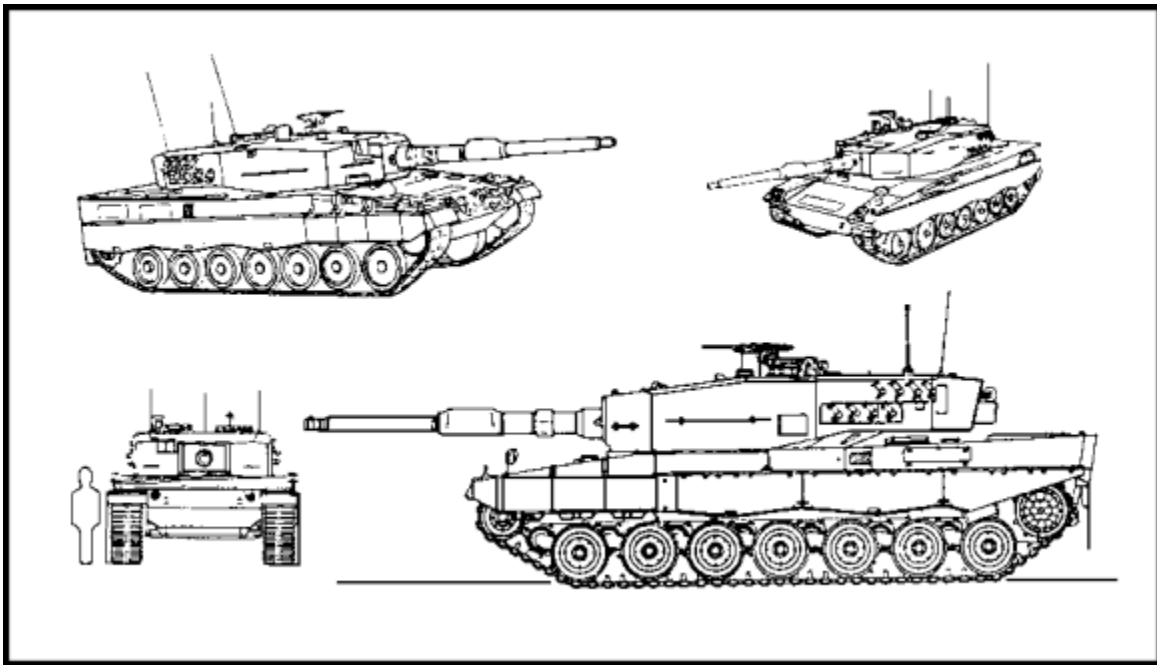
The Leopard 1 fires all standard 105-mm rounds made in Canada, France, Germany, Israel, the United Kingdom and the USA. The turret carries 13 rounds, and another 42 are stowed in the hull. The weapon system's first-round hit probability, even when on the move and firing at moving targets, increases with a gun stabilization system and modern fire control systems such as a primary stabilized line of sight, laser rangefinder, or an integral thermal imaging system.

(b) Secondary Armament. A 7.62-mm Rheinmetall MG 3 machine gun is mounted coaxially with the main gun. It is provided with 1,250 rounds of ready-use ammunition. Another MG 3 machine gun is located at the commander's or loader's position for anti-aircraft defense. Four smoke dischargers are on either side of the turret.

(6) Countries Served. Leopard 1 tanks are in service with the following countries:

Australia	Germany	Netherlands
Belgium	Greece	Norway
Canada	Italy	Turkey
Denmark		

h. Leopard 2 Main Battle Tank (Figure 1-8). The Leopard 2 is characterized by its bulky, angular appearance and very high automotive performance.



**Figure 1-8. Leopard 2 Main Battle Tank Armed with 120-mm Smoothbore Gun.**

Germany had some 1,800 Leopard 2s delivered by 1987, and another 250 are replacing Leopard 1A4s. Early units are being overhauled and having interim image intensification night sights replaced with standard integral thermal sights. Newer units eliminated the side-wind sensor, relocated the tank filler openings, improved exhaust gratings, modified tool stowage, and added a commander's cupola covering. Final units have a new paint scheme, digital core for the fire control computer, ammunition hatch on the left side of the turret welded shut, and a fire suppression system.

By 1989, an upgraded armor package was developed, and the commander's roof-mounted sight was to be fitted with a laser rangefinder with thermal imaging capability.

(1) Variants. Except for Dutch and Swiss main battle tanks, the only variants have been prototypes. Except for the Swiss and Dutch MBT variants, no other variants are in production.

(a) Dutch Leopard 2. The Dutch Leopard 2s have different 7.62 mm machine guns, smoke dischargers, passive night periscope for the driver, radios, and intercom equipment.

(b) Swiss Leopard 2. Similar to the German vehicle, the Swiss Leopard 2 has a different engine and transmission, Swiss radios and intercoms, and Swiss coaxial and anti-aircraft machine guns.

(2) Recognition Features. The Leopard 2 has the following recognition features:

- Fully tracked.

- Seven evenly spaced road wheels.
- Grenade launchers on the rear side of the turret.
- Two circular exhaust louvers on the top of the rear of the hull.
- 1,600-horsepower turbocharged diesel engine.
- Front three panels of track sideskirting are straight.
- Three rear skirts have jagged or wavy design.
- Sides of hull are flat and vertical (squared).
- Upper and lower glacis form a straight edge.
- Driver's compartment located at the right front.
- Loader hatch on the left side of the turret.
- Large, slab-type turret with flat surfaces, angular appearance, and overhang in rear.
- Turret centered on the hull.
- Turret has a cutout to the right of the gun mantle.
- Long hand rails on the left and right side of the turret.
- Shorter cargo rails on the left and right of the turret frontal armor.
- Two round hatches in line in the center of the turret roof.
- Tank commander's hatch on the right side.
- Rectangular gun mantle.
- 120-mm gun with thermal jacket and MRS collimator.
- Rounded bore evacuator aft of center.
- Coaxial machine gun port to the left of the main gun.
- Panoramic sight mounted forward of the commander's hatch.
- Gunner's sight is recessed into the right front of the turret.
- Telescope port at the right of the main gun.

(3) Vehicle Characteristics. The Leopard 2 has a four-stroke, 12-cylinder multi-fuel, exhaust turbo-charged, liquid-cooled engine. The hull is made of spaced multi-layer armor and divided into the driver's compartment in front, the fighting compartment in the middle, and the engine compartment in the rear. Standard equipment includes an NBC system, powerpack preheating, crew compartment heater, fire-extinguishing system, electric bilge pumps, and a hull escape hatch behind the driver.

The driver sits on the right front with three periscopes and has a hatch cover opening to the right. Some ammunition is stored to his left. The commander and gunner are on the left of the turret, the loader on the right. The commander's hatch has all-around periscopes and a circular cover opening to the rear. In front of the commander's hatch is a stabilized panoramic periscope. Another periscope on the roof is for the gunner. The loader on the left has a single periscope and hatch cove opening to the rear. On the left side of the turret is an ammunition resupply hatch. There is a stowage basket on the rear of the turret.

The torsion-bar suspension supports dual rubber-tired road wheels, four track return rollers, and rear drive sprocket. Steel-reinforced rubber skirts cover the rear two-thirds

of the tracks. The front third are covered by special, thick armored boxes. Other features are:

### **Measurements**

<u>Combat Weight</u> , 55,150 kg	<u>Track</u> , 2.785 meters
<u>Hull length</u> , 7.72 meters	<u>Track width</u> , 635mm
<u>Hull width</u> , 3.7 meters	<u>Track length on ground</u> , 4.945 meters
<u>Overall height</u> , 2.787 meters	<u>Fuel capacity</u> , 1,200 liters
<u>Ground clearance</u> , 0.537 meters front, 0.487 meters rear	<u>Maximum road range</u> , 550 km
	<u>Maximum road speed</u> , 72 km/h

(4) Vehicle Capabilities. The Leopard 2 can

- cross a 3-meter trench.
- mount a 1.1-meter vertical step.
- climb a 60-percent grade.
- ford 1 meter without preparation.
- ford 2.25 meters with preparation.
- ford 4 meters with snorkel.

(5) Armament Characteristics. Main and secondary armament of the Leopard 2 are discussed in the following subparagraphs.

(a) Main Armament. The 120-mm smoothbore gun has a barrel length of 5.6 meters. It fires APFSDS-T and HEAT-MP-T ammunition. It has an effective range of well over 2,000 meters. Leopard 2 main gun ammunition is interchangeable with that of the American M1A1. Some of the 42 rounds are stored in the left side of the turret bustle, which has blow-out panels that explode upward if hit.

(b) Secondary Armament. A 7.62-mm machine gun is mounted coaxially to the left of the main gun, and another can be mounted on the loader's hatch. On either side of the turret are eight smoke dischargers.

(6) Countries Served. Users are:

Australia	Germany	Norway
Belgium	Italy	Germany
Canada	Netherlands	Switzerland
Denmark		

i. Leopard 2 (Pz 87 Leo) Main Battle Tank. Swiss Leopard 2s are similar to the German Leopard 2s. The Swiss Panzer 87 Leo, as it is usually called, have Swiss radios, antennas, and

machine guns, an improved driver's hatch, a digital computer instead of the analog computer, a fire/explosion detection and suppression system for the crew compartment, an improved NBC protection system, hydraulic track tensioning units, a Baird passive night driving periscope, optical master warning for the driver when driving with the hatch open, and some other minor modifications.

j. Merkava Main Battle Tank. There are three versions of the Merkava MBT, the Mark 1, 2, and 3. The Mark 3 version has several improvements over the previous versions.

(1) Recognition Features. The Merkava can be recognized as follows:

- Six road wheels linked in pairs to suspension units for high mobility.
- Sideskirts are cut to expose road wheels.
- Thick-walled, single cast hull.
- Hull has a long sloping under-glacis.
- Engine is mounted forward and to the right of the fighting compartment.
- Narrow wedge-shaped turret with a large rear overhang and bustle rack.
- Rear door loading capability (accommodates 9 or 10 people).

(2) Vehicle Characteristics. An air-cooled diesel develops 1,200 horsepower. Suspension consists of 12 road wheels independently mounted on trailing arms and sprung by pairs of concentric coil springs. The first and last road wheels have hydraulic bump stops, and the four central wheels have hydraulic rotary dampers. The Mark 3 version has an advanced threat warning system which displays threat warnings on a small panel at the commander's station. The armor is of a modular type and covers both the turret and the hull on the Mark 3. It provides a much higher degree of protection than the Mark 1 and 2. The armor can also be changed in the field. Some key specifications of the Merkava are:

#### **Measurements**

Combat Weight, 61,000 kg

Ground clearance, 0.53 meters

Hull length, 7.60 meters

Track width, 660mm

Overall width, 3.70 meters

Maximum road speed, 55 km/h

Overall height, 2.76 meters

(3) Vehicle Capabilities. The Merkava can:

- cross a 2.35-meter trench.
- mount a 1-meter vertical step.
- climb a 70-percent grade.
- ford 1.38 meters without preparation.
- ford 2.4 meters with preparation.

(4) Armament Characteristics. The main and secondary armament are discussed in the following subparagraphs.

(a) Main Armament. The Mark 3 version has a 120-mm smoothbore gun fitted with a thermal sleeve. It has a range of 1,700 meters. The Merkava carries 50 rounds of 120-mm ammunition. The Mark 1 and Mark 2 versions have a 105-mm main gun.

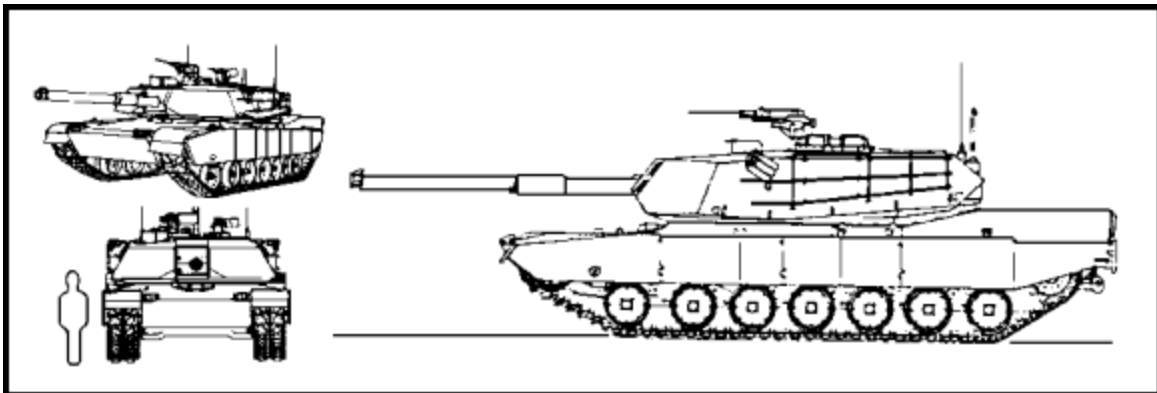
(b) Secondary Armament. The Mark 3 version has a 7.62-mm machine gun mounted coaxial with the main gun and there are another two 7.62-mm roof mounted machine guns. The Merkava carries a total of 10,000 rounds of 7.62-mm ammunition. On each side of the turret there is a bank of 78.5-mm smoke grenade launchers. There is also a 60-mm turret mounted mortar.

(5) Countries Served. Israel is the only country that uses the Merkava MBT.

k. M1 Abrams Main Battle Tank ([Figure 1-9](#)).

The M1 offers improvement over M60 series tanks in areas of protection, mobility, firepower. The M1 also offers improvement in reliability, availability, maintainability, and durability (RAM-D). It has a very high automotive performance, but quiet operation due to its turbine engine.

For protection against newer anti-tank weapons, the M1 turret and hull has advanced armor protection similar to the English Chobham armor used on the Challenger and Leopard 2 main battle tanks.



**Figure 1-9. M1 Abrams Main Battle Tank.**

(1) Variants. The following variants of the M1 have been produced.

(a) Improved M1. The improved M1 is essentially the basic M1 with improved armor protection.

(b) M1A1. In addition to the improved armor of the improved M1, the M1A1 has the 120-mm gun and an integrated NBC system. The system provides the crew

with conditioned air for breathing and also supplies cooling or heating for the crew as required while they are wearing their protective suits and face masks.

The M1A1 has two blow-off panels in the turret roof, while the M1 has three. Of the 40 rounds of 120-mm ammunition carried by the M1A1, 34 are in the turret bustle and 6 are in a rear hull box. In addition to the smoke dischargers, the M1A1 also has an engine-operated smoke-laying system.

(c) M1A1 with Depleted Uranium (DU) Armor. This significantly improved armor was designed to meet Warsaw Pact anti-armor weapons. Depleted uranium has two and a half times the density of steel.

(d) M1A1 for U.S. Marine Corps. The M1A1 for the U.S. Marine Corps is identical to the U.S. Army version with few minor exceptions. The Marine M1A1 includes a deep fording kit with a cap for the 120-mm main gun and engine intake and exhaust towers which enable the tank to ford a depth of 2 meters. It also has more tie-downs for secure stowage on board ship.

(e) M1 Abrams Bulldozer Kit. The bulldozer kit fits onto the MBT's lifting eyes and towing lugs. It is powered by the tank's 24 volt electrical system.

(f) M1 AVLB. A three-part Heavy Assault Bridge (HAB) will span a gap of 30 meters, compared to the 19.2 meters of the current HAB on the M48/M60 chassis. It will weigh some 5,000 kg less than the current two-part scissors bridge. The high-strength aluminum and composite materials will be field-weldable. The new HAB will take vehicles up to 70 tons.

(2) Recognition Features. The M1 Abrams has the following features:

- Seven road wheels with a wider gap between the first and second road wheels.
- Needle-nosed turret with flat, well-sloped sides centered on the chassis.
- Gun tube with a bore evacuator 2/3 way down from the muzzle.

(3) Vehicle Characteristics. The driver sits in the front center in a semi-reclining position when his hatch is closed. He steers with a motorcycle-type T-bar with twist grip controls for throttle and electronic fuel management. A panel displays the condition of fluid levels, filters, batteries, electrical connectors, and circuit breakers. Opening to the right is the driver's single hatch which has three integral periscopes. He has a 120-degree field of view. His night-driving periscope will fit into the loader's periscope housing.

The commander and gunner sit on the right of the turret, and the loader on the left. The commander has six periscopes that cover 360 degrees. He also has a x3 sight for the 12.7-mm machine gun, and an optical extension of the gunner's primary sight (GPS). This GPS has dual x10 and x3 day optics or x10 and x3 thermal imaging night vision, a Hughes laser rangefinder, and sight stabilization. The gunner has a x8 auxiliary sight. The loader has a x1 periscope that can traverse 360 degrees.



The Hughes infrared Thermal Imaging System (TIS) senses a small difference in heat radiated by objects. This is converted to electrical signals which are displayed on a cathode ray tube, similar to a TV picture. This image also is projected into the gunner's eyepiece. His sight displays target range information, ready-to-fire, and other systems indications. It also indicates if the laser rangefinder has received more than one return. The fire control computer has data entry and test panels for fault diagnosis.

Armor bulkheads separate the fuel tanks from the crew. Sliding armor doors and armored boxes isolate the main gun ammunition. A Halon fire-extinguishing system reacts to the outbreak of a fire in two milliseconds and extinguishes the fires in less than 250 milliseconds. If penetrated by a HEAT projectile, the ready-use ammunition stowed in the turret bustle would explode through top panels. The turret bustle magazine also vents to the rear as well as upwards. Heavy access doors are kept closed automatically when the loader is not holding a pressure switch.

An engine-driven pump provides power for the electro-hydraulic gun and turret. A 1,500 horsepower gas turbine engine operates primarily on diesel or kerosene-based fuel, but can operate on gasoline during emergencies. Most engine components can be removed without taking out the engine. A complete powerpack can be removed and replaced in less than an hour, compared with four hours for the M60 series tanks. The gas turbine delivers more horsepower than a comparable diesel because of the low cooling requirement. Exhaust is at the rear and air inlet at the hull top.

### **Measurements**

<u>Combat Weight</u> , 54,545 kg	<u>Track length on ground</u> , 4.65 meters
<u>Hull length</u> , 7.918 meters	<u>Fuel capacity</u> , 1,907.6 liters
<u>Overall width</u> , 3.653 meters	<u>Maximum road range</u> , 498 km
<u>Overall height</u> , 2.885 meters	<u>Maximum cross country speed</u> , 48.3 km/h
<u>Ground clearance</u> , 0.432 meters	<u>Maximum road speed</u> , 72.4 km/h
<u>Track width</u> , 635mm	

(4) Vehicle Capabilities. The M1 can:

- cross a 2.743-meter trench.
- mount a 1.244-meter vertical step.
- climb a 60-percent grade.
- ford 1.219 meters without preparation.
- ford 1.98 meters with preparation.

(5) Armament Characteristics. A stabilization system permits accurate firing on the move. The gunner merely places his graticule on the target, and uses the laser rangefinder to determine the range. Then a computer applies necessary angles, and the gunner opens fire. The computer also gets information from a wind sensor and a

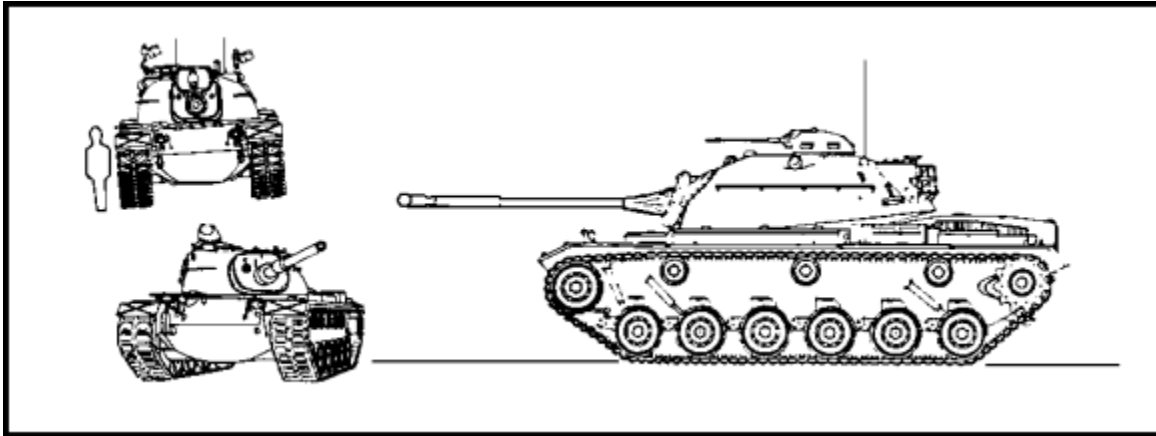
pendulum static can't sensor on the turret roof. The main gun has a muzzle reference system to measure the bend of the gun. The gunner manually sets battle sight range, ammunition type, barrel wear, muzzle reference compensation, barometric pressure, and ammunition temperature.

(a) Main Armament. The turret can accept the standard 105-mm M68 series gun or the German Rheinmetall 120-mm smoothbore gun (American designation M256). The 105-mm gun fires standard M60 type armor piercing rounds. A new depleted uranium (DU) round has higher density and penetrating capabilities (not exported by the U.S.). The tank carries 55 rounds of 105-mm ammunition; 44 in the turret bustle, three horizontally in spill-proof containers on the turret basket, and eight in a hull box. When fitted with the 120-mm gun, the tank is designated M1A1. The M1A1 carries 40 rounds of 120-mm ammunition; 34 in the turret bustle and six in a rear hull box. Maximum effective range is 3,000 meters.

(b) Secondary Armament. Mounted coaxially to the main gun is a 7.62-mm M240 machine gun. A similar machine gun is skate-mounted on the left side of the turret for the gunner. The M1 carries some 11,400 rounds of 7.62-mm ammunition. A standard 12.7-mm (50-cal.) Browning M2 HB machine gun is located at the commander's station. It can be aimed and fired from within the turret. The tank carries 1,000 rounds of 12.7-mm ammunition. A M250 six-barrelled smoke discharger is on either side of the turret. The M1A1 also has an engine-operated smoke-laying system.

(6) Countries Served. Congress approved the sale of 555 M1A1s to Egypt, with the first 15 complete tanks to be delivered in 1991. General Dynamics stated other potential customers as Canada (250 tanks), Pakistan (some 400), Saudi Arabia (315), and possibly Kuwait.

I. M48 Series/M48A5 Main Battle Tank (Figure 1-10). Design work for the M48 series MBT began in 1950, and the first production model was completed in 1952. By completion of production, 11,703 M48s were built.



**Figure 1-10. M48A2 (left) and M48A5 (right) Main Battle Tank.**

(1) Variants. The M48 went through several modifications. They are discussed in the following subparagraphs.

(a) M48. The first model has a small driver's hatch, five track return rollers, no tensioning idler, no dust shields on the fenders, and a "T" or cylindrical-type blast deflector on the barrel. The commander's cupola has the 12.7-mm machine gun on an open mount rather than in a fully enclosed cupola.

(b) M48C. A letter C is embossed on the right front of the hull meaning this training tank has a non-ballistic mild steel hull unsuitable for combat. This model is used for training only.

(c) M48A1. This model has a larger driver's hatch, fully-enclosed commander's cupola, fender dust shields, rear track idler wheel, five track return rollers, and a "T" type blast deflector.

(d) M48A2. This has a fuel-injection system, larger fuel tanks, improved engine deck to minimize infrared detection, constant-pressure turret control system, improved fire-control system, modified commander's cupola, stowage basket mounted at the turret rear, and the main gun is fitted with a "T" type blast deflector. Also, jettisonable long-range fuel tanks can be fitted at the rear.

(e) M48A2C. This model is almost identical to the M48A2, except for slight differences in the optical and fire control equipment. Most models do not have the track tensioner wheel.

(f) M48A3. A rebuild of earlier tanks, this has the same diesel engine as the M60A1, an improved fire control system, and the commander's cupola is modified by mounting a circular ring with vision blocks between the roof of the turret and the base of the commander's cupola. Most have only three track return

rollers and no rear idler. They also have "T" type blast deflectors and fender dust shields.

(g) M48A5. This was a rather large modernization (M48A4 was canceled). The M48A5 is used by the National Guard. The M48A5 version includes: top-loading air cleaner, top-deck grille, engine and transmission shroud, gun travel lock, exhaust grilles, new engine, track, final drives, tow pintle, hull turret seal, torsion bar knockout, bulkhead, fuel tank, track support rollers and shield, turret basket, modified hull ammunition stowage, driver's controls, periscope and escape hatch, gun shield and cover, turret and gun control, 105-mm gun, composite headlamp, searchlight, M87 gun mount, and various ballistics kits. Also provided is a modified commander's cupola and a 7.62mm M60D machine gun at the loader's hatch.

(h) German M48s. Germany rebuilt 650 M48s to a new configuration known as the M48A2GA2. The modifications included the replacement of the 90-mm gun by the same 105-mm L7A3 rifled gun used in the Leopard 1. Further modifications included a new commander's cupola, modified ammunition stowage, passive night vision equipment for the driver, commander, and gunner, and modifications to the fire control system. German M48s also have four German smoke dischargers on either side of the turret. The driver has an image-intensifier periscope. A passive TV aiming and observation unit with a screen that can be seen by both the commander and gunner is mounted over the 105-mm gun.

(i) M48 Armored Vehicle Launched Bridge. An M48 chassis is fitted with a scissors bridge that is launched hydraulically over the front in three minutes. The bridge opens to 19.2 meters and spans a gap of 18.3 meters. It weighs 14,470 kg. and has a 60,000 kg. capacity. The two-man AVLB weighs 55,746 kg. with bridge.

(2) Recognition Features. The gunner sits forward and below the commander. His telescopic sight is mounted on the roof and is linked to the main gun.

The loader has a hatch cover opening to the rear. To the rear of the turret is a dome-shaped ventilator and stowage basket.

Other key features of the M48 are:

- Six road wheels with support rollers.
- Raised commander's cupola on the right top of the turret.
- Oval/dome-shaped turret located forward on the chassis.
- Bore evacuator and blast deflector at the end of the muzzle.

(3) Vehicle Characteristics. The cast hull is boat shaped with additional sections welded into position. The driver sits in the center front with a hatch cover opening to the right.

In front of him are three periscopes. A night periscope is in the turntable in the driver's hatch.

The one-piece cast turret holds the commander and gunner on the right, and the loader on the left. The commander has a 360-degree traversable cupola with five vision blocks and a sight for controlling the .50-cal. machine gun.

Infrared driving lights are fitted as standard and most models have an infrared/white light searchlight mounted over the main gun which has a maximum range of 2,000 meters. Standard equipment also includes an NBC system, heaters, external infantry phone, and provision for installing a dozer blade on the front of the hull. The following paragraphs include M48 specifications.

#### **Measurements**

<u>Model</u>	<u>M48</u>	<u>M48A1</u>	<u>M48A2</u>	<u>M48A3</u>	<u>M48A5</u>
Combat wt. (kg)	44,906	47,173	47,173	47,173	48,987
Hull length (m)	6.705	6.87	6.87	6.882	6.419
Width (m)	3.631	3.631	3.631	3.631	3.631
Height (m)	3.241	3.13	3.089	3.124	3.086
Ground clearance	0.393	0.387	0.385	0.406	0.419
Track (m)	2.921	2.921	2.921	2.921	2.921
Track width (mm)	711	711	711	711	711
Track length on ground (m)	4.0	4.0	4.0	4.0	4.0
Road speed (km/h)	41.8	41.8	48.2	48.2	48.2
Fuel (liters)	757	757	1,268	1,420	1,420
Road range (km)	113	113	258	463	499

#### **Armor (all models)**

Hull front	101/120mm	Turret front	110mm
Hull sides front	76mm	Turret sides	76mm
Hull sides rear	51mm	Turret rear	50mm
Hull top	57mm	Turret top	25mm
Hull floor	12.7/63mm		
Hull rear	44mm		

(4) Vehicle Capabilities. The M48 can

- cross a 2.59-meter trench.
- mount a 0.915-meter vertical step.
- climb a 60-percent grade.

- ford 1.219 meters without preparation.
- ford 2.438 meters with preparation.

(5) Armament Characteristics. The main and secondary armaments of the M48 are discussed below.

(a) Main Armament. An M41 90-mm gun has an evacuator chamber, blast deflector, and breech mechanism assembly. The barrel has a life of 700 equivalent full-charge rounds. The gun fires various anti-personnel, armor-piercing, high-explosive, anti-tank, and smoke rounds. Belgian and Israeli companies have developed improved armor penetrating rounds for this gun. Eight rounds are at ready use in the turret, 16 stowed vertically around the turret ring, 19 to the left, and 11 to the right of the driver. Newer versions have a 105-mm gun.

(b) Secondary Armament. Mounted coaxially to the left of the main armament is a 7.62-mm M73 machine gun. Earlier models have a 7.62-mm M1919A4E1 weapon. On the commander's cupola is a 12.7-mm Browning M2 HB machine gun that can be aimed and fired from within the cupola in elevation of -10 to +60 degrees.

(6) Countries Served. The M48 MBT in one or another version is in service with the following countries.

Germany	Morocco	Taiwan
Greece	Norway	Thailand
Iran	Pakistan	Tunisia
Israel	Portugal	Turkey
Jordan	South Korea	United States
Lebanon	Spain	Vietnam

m. Super M48 Main Battle Tank. A German private venture offers a retrofit package for improvements to the vehicle, armor protection, mobility, or firepower. The Super M48 main battle tank has additional armor protection for turret front and sides, new tracks and skirts, commander's cupola, and 105-mm gun with a thermal sleeve.

(1) Recognition Features. The Super M48 MBT has

- 105-mm main gun.
- six evenly spaced road wheels.
- uneven or jagged side skirts.

(2) Vehicle Characteristics. Add-on armor is fastened to the basic structure of the turret front and sides by elastic elements. If damaged or hit, another panel can be quickly interchanged.

An MTU MB 837 Ka-501 diesel engine develops 1,000 horsepower at 2,300 rpm. It has an intercooler, exhaust turbo-chargers, flat radiators, and an air cleaner system with a dust evacuation blower. This diesel has a much greater operating range than the 113 km for the gasoline engine of the original M48. A fully-automatic steering transmission is integrated with a brake system that has a retarder and multiple disc brakes. The powerpack is equipped with quick-disconnect couplings and mountings to allow for quick replacement.

The top decking of the engine compartment is modified. The fuel system was changed to a 1,050-liter capacity, with five storage tanks and one delivery tank. The Super M48 also has a new electrical system and fire-suppression system.

A MOLF 48 firecontrol system has a roof-mounted primary gunner's sight incorporating day sight, laser rangefinder, and thermal night sight. A computer controls the main gun and coaxial machine gun. The system can engage stationary or moving targets while the tank is either stationary or moving. The stabilization system has four modes:

- "stab on" when stabilized gun and turret are slaved to the gunner's primary stabilized sight.
- "stab ready" for self-stabilized gun and turret, manual laying with hydraulic power, and line of sight electrically slaved in elevation and azimuth
- "observation" for manual laying by hand cranks and line of sight is electrically slaved to elevation and azimuth.
- "turret off" for manual laying by handcranks, gunner aims using FERRO Z19 panoramic telescope.

The suspension system gives an improved ride and good pre-stabilization for the firecontrol system. A new track has removable rubber pads and spoon-shaped end connectors for increased life and reduced track noise. Armored side skirts help reduce dust going into the air cleaners.

### **Measurements**

Combat weight, 53,000 kg

Track width, 711mm

Hull length, 6.87 meters

Road speed, 56.3 km/h

Hull height, 1.475 meters

Fuel capacity, 1,050 liters

to cupola top, 2.9 meters

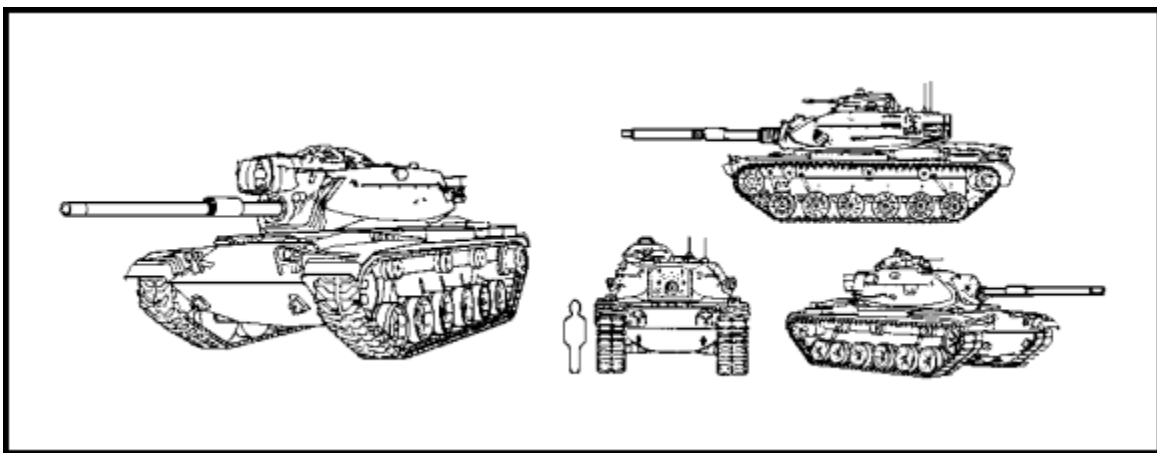
(3) Vehicle Capabilities. The Super M48 MBT can

- cross a 2.69-meter trench.
- mount a 0.915-meter vertical step.
- climb a 60-percent grade.
- climb a 30-percent side slope.
- ford 1.219 meters.

(4) Armament Characteristics. A 105-mm L7A3 rifled tank gun replaces the M48 tank's 90-mm gun. The Super M48 carries 40 rounds of 105-mm ammunition in the hull and on the turret platform. There is a new electro-hydraulic gun/turret drive and weapon stabilization system.

A bank of four Wegmann smoke/fragmentation dischargers may be fitted on either side of the turret towards the rear.

n. M60 Series (M60A1/M60A3) Main Battle Tank (Figure 1-11). The XM60 was an M48 rebuilt for increased operational range and mobility with a minimum of refueling and servicing, plus an improved main gun. Chrysler began producing the M60 in 1960. General Dynamics completed the production of M60A3s in 1987.



**Figure 1-11. M60A1 (left) and M60A3 (right) Main Battle Tank Armed with 105-mm Main Gun.**

(1) Variants. The M60A1 has a new engine, fully-stabilized main gun, top-loading air cleaner, tracks, and better night-vision equipment.

(a) M60A2. This model has been phased out. Most of the 526 M60A2s built have been converted to other uses such as AVLB, M728 Combat Engineer Vehicle, or Counter Obstacle Vehicle.

(b) M60A3. Many improvements such as the add-on stabilization system, reliability improved selected equipment (RISE) engine, and smoke grenade launchers were first fitted to the M60A1. The M60A3 mainly has an improved fire control system, with laser rangefinder and solid-state computer. It computes range data, cross-wind velocity, air temperature, gun trunnion tilt, air density, altitude, target tracking rate, and ammunition ballistics. The cross-wind sensor is spring mounted for encountering low branches.

The gunner's control unit has a self-test row of lights for less burdensome troubleshooting. Thermal sights improved night-fighting capability and enabled the tank to see through smoke and ground cover. This AN/VSG thermal imaging



equipment replaced the gunner's passive night-vision periscope. The major improvements for the M60A3 are:

- Top-loading air cleaner.
- AN/VSS-1 searchlight replaced by AN/VSS-3A on passive tanks thermal gunner's sight.
- T97 tracks replaced by T142 tracks with removable pads.
- AVDS-1790-2C RISE engine.
- Thermal shroud for main gun.
- Laser rangefinder.
- 650 amp oil-cooled alternator.
- Solid-state computer.
- British-style six-barrelled smoke dischargers fitted to either side of turret.
- Engine smoke generator.
- Automatic Halon fire-extinguishing system.

(c) Mine Roller System. The M60A1 and M60A3 MBTs have mine roller systems that can be installed.

(d) XM1060 Robotic Breaching Assault Tank (ROBAT). The ROBAT has been tested for a possible 142 conversions of the M60 chassis. The crew may operate the vehicle by remote control by a fiber-optic video link, or the commander and driver sit in tandem in two armored pods fitted with an NBC system. The ROBAT fires a line filled with explosive over a minefield and then detonates any remaining mines with front-mounted mine-clearing rollers. A Cleared Lane Marking System (CLAMS) dispenses day or chem-illuminant light sticks from the rear to mark the cleared lane.

(e) M9 Bulldozer Kit. This kit is a depot retrofit package that gives M60s bulldozing capabilities.

(f) M60 AVLB. The AVLB has a hydraulic launching mechanism and an aluminum scissors bridge. The 14,470-kg bridge opens in two minutes to a length of 19.2 meters. It spans a 18.288-meter gap.

(g) M728 Combat Engineer Vehicle. The M728 has a short-barrelled 165-mm M135 demolition gun, a 7.62-mm machine gun mounted coaxially to the main gun, and a 12.7-mm machine gun at the commander's cupola for ground and anti-aircraft use. A hydraulic dozer blade clears obstacles and prepares fire positions. Pivoted at the front is an A-frame that works with a two-speed 11,340-kg winch. It also has an infrared searchlight. The vehicle is also used by Saudi Arabia and Singapore.

(h) Israeli Upgraded M60 Series Main Battle Tank. Combat experience resulted in many upgrades to Israel's numerous M60 series tanks. A major upgrade was announced in 1989 to extend the operational lives of their tanks into the 1990s.

Areas upgraded include an Israeli-developed thermal sleeve for the 105-mm gun, explosive reactive armor, new Urdan commander's cupola, two roof-mounted 7.62-mm machine guns, and the Israeli Military Industries (IMI) CL-3030 instantaneous self-screening system either side of the main gun.

A new passive armor is the key part of the latest upgrade which also included a new engine, tracks, and fire control system. The armor is fitted to the glacis, nose, turret front and sides, and forward part of the roof. Lateral protection is provided by armored skirts. Openings in the armor package can be seen in the right side for the gunner's sight, and in the left side for the coaxial machine gun. This passive armor protects against kinetic energy and chemical energy attack.

Appearing like banks of bricks, earlier explosive reactive armor was for chemical energy, the RPG-7 and Sagger-type anti-tank guided weapons are used by Arab armies. Called Blazer, this armor adds less than one ton to the vehicle weight. It has small panels bolted onto the hull and turret that react to HEAT attack but not small arms ammunition, fire or artillery fragments. Once hit, the panel no longer provides protection, but the possibility of a second hit is considered remote.

The Matador computerized fire control system, already in service on the Merkava, includes a laser rangefinder. Remaining unchanged is the IMI 105-mm M68 gun installed on all Israeli M60, Centurion, and Merkava Mk 1 and 2 vehicles. This gun may have significantly improved armor piercing rounds developed by IMI.

(2) Recognition Features. The M60 MBT has a wedge-shaped nose and vertical side walls, whereas the M48 hull had a rounded nose and elliptical cross section. The M60A1 has a cast section hull with forged floor plates welded together. The driver sits in front and has a hatch cover that opens to the right. Forward of his hatch are three periscopes. Near the driver's position is a hull escape hatch.

In the all-cast turret, the loader is on the left, and the commander and gunner on the right. At the rear of the turret is an external stowage basket. The loader has a rear-opening hatch cover with an integral 360-degree periscope.

The commander's cupola can be traversed through 360 degrees. It has eight vision blocks, and a sight in the forward part of a hatch cover that swings to the rear. The gunner has a telescopic periscope with rangefinder or night vision capability and sits in front of and below the commander. Other key features are as follows:

- Six road wheels with three support rollers.
- High silhouette and prominent cupola.
- Gun tube with bore evacuator 2/3 way down from the muzzle.
- No bore evacuator.
- Streamlined wedge- or tortoise shell-shaped turret.
- Thermal shielding on the barrel.

- .50-caliber machine gun mounted in the cupola.
- Rectangular searchlight over the main gun on the M60A1 (no searchlight on M60A3).
- M60A1 is similar to M60A3, but lacks thermal shroud and sometimes the smoke grenade launchers.
- M60A2 has a long narrow and square-sided turret with a short, stubby gun tube.

(3) Vehicle Characteristics. The engine compartment is at the rear of the hull and is separated from the fighting compartment by a fireproof bulkhead. The torsion bar suspension system consists of six dual rubber-tired road wheels with the idler at the front, the drive sprocket at the rear, and three track return rollers.

The NBC system is a central air filtration type which pipes fresh air to each crew member via a tube. The crew compartment is provided with a heater. A RADIAC NBC detector can be fitted if required. Some key characteristics and specifications are as follows:

	<b>Measurements</b>		
<u>Model</u>	<u>M60</u>	<u>M60A1</u>	<u>M60A3</u>
<u>Combat Wt (kg)</u>	49,714	52,617	52,617
<u>Length Hull (m)</u>	6.946	6.946	6.946
<u>Width (m)</u>	3.631	3.631	3.631
<u>Height (m)</u>	3.213	3.27	3.27
<u>Ground Clearance (m)</u>	0.463	0.463	0.45
<u>Track (m)</u>	2.921	2.921	2.921
<u>Track Width (mm)</u>	711	711	711
<u>Track length on ground (m)</u>	4.235	4.235	4.235
<u>Road Speed (km/h)</u>	48.28	48.28	48.28
<u>Fuel (liters)</u>	1,457	1,420	1,420
<u>Range (km)</u>	500	500	480

(4) Vehicle Capabilities. The M60 can

- cross a 2.59-meter trench.
- mount a 0.914-meter vertical step.
- climb a 60-percent grade.
- climb a 30-percent side slope.
- ford 1.219 meters without preparation.
- ford 2.438 meters with preparation.

(5) Armament Characteristics. The main and secondary armament characteristics are discussed below.

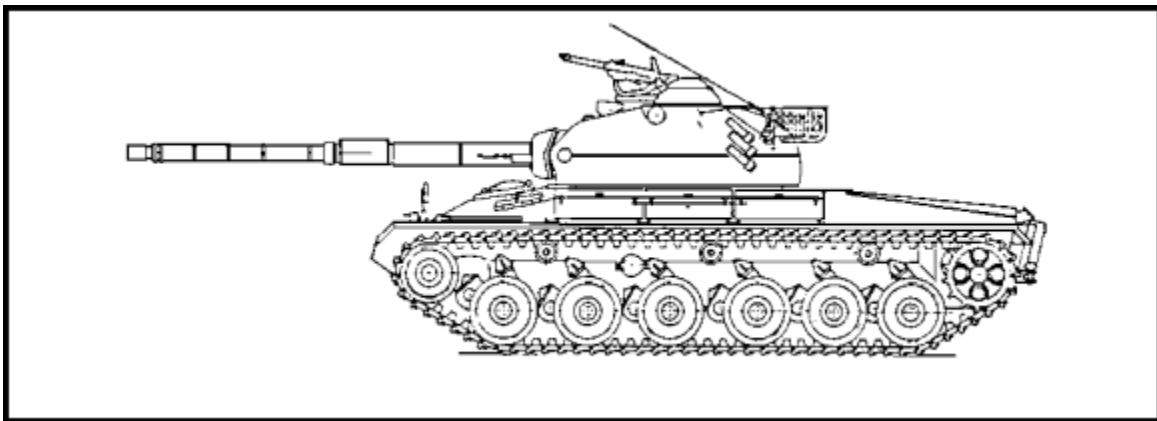
(a) Main Armament. The M60, M60A1, and M60A3 have a 105-mm M68 rifled tank gun with bore evacuator. Between six and eight rounds a minute can be fired by a well-trained crew. Thirteen rounds are carried in the turret for ready use, 21 in the turret bustle, 3 under the gun, and 26 in the forward part of the hull. The 105-mm gun fires a variety of armor piercing, anti-personnel, high-explosive, smoke, or dummy rounds. Maximum effective range is 3,000 meters (M60A1--2,000 meters).

(b) Secondary Armament. An M85 12.7-mm (.50-cal.) machine gun is mounted in the commander's cupola. A 7.62-mm machine gun is mounted coaxially to the main gun.

(6) Countries Served. The M60 or variant is used in the following countries:

Austria	Iran	North Yemen	Taiwan
Bahrain	Israel	Oman	Tunisia
Egypt	Italy	Saudi Arabia	United States
Ethiopia	Jordan	Sudan	

o. Panzer (Pz) 61 and Pz 68 Main Battle Tank. This section discusses the Swiss Pz 61 and the Pz 68 MBTs. Production began on the Pz 61 in 1961. Development of the Pz 61 led to the Pz 68. [Figure 1-12](#) shows a Swiss Army Pz 61 MBT.



**Figure 1-12. Pz 61 Main Battle Tank.**

(1) Variants. There are several variants of the Pz 68. The Pz 68 became known as the Mark 1. Therefore, the variants discussed below begin with the Mark 2 version.

(a) Pz 68 Mark 2. This vehicle is basically the Pz 68 Mark 1 with an alternator, thermal sleeve for the main armament, and a system for extracting carbon monoxide.

(b) Pz Mark 3. This has all of the improvements of the Marks 1 and 2, but also has a larger turret.

(c) Pz Mark 4. This is similar to the Mark 3.

(d) Armored Recovery Vehicle. The ARV is based on the Pz 68 chassis. The vehicle is equipped with a main winch with 120 meters of cable and a maximum capacity of 25,000 kg. The capacity can be increased to 75,000 kg by using snatch blocks. There is an auxiliary winch used to pull out the main cable and has 240 meters of cable. A hydraulically operated dozer blade which is used to stabilize the vehicle or for dozing is mounted at the front. An A-frame with a 15,000 kg lifting capacity is pivot-mounted at the front of the ARV. The ARV is outfitted with a full range of tools and cutting equipment. There is a crew of five. The loaded weight is 38,000 kg. Armament consists of a single 7.5-mm machine gun and eight smoke dischargers.

(e) Armored Bridgelayer. The bridgelayer is based on the Pz 68 chassis. The bridge has an overall length of 18.23 meters and a maximum capacity of 60,000 kg. Its normal capacity is 50,000 kg. The bridgelayer has a crew of three and weighs 44,600 kg with the bridge.

(2) Recognition Features. The Pz 61 and Pz 68 have the following features:

- Six evenly spaced road wheels.
- Rounded turret mounted forward of the center of the hull.
- Pz 61 has no bustle.
- Fume extractor on main gun.

(3) Vehicle Characteristics. The vehicle characteristics for the Pz 61 and the Pz 68 are discussed separately in the following subparagraphs.

(a) Pz 61. The Panzer 61 has a one-piece cast hull and turret. The driver sits at the front center, and has three periscopes in front of his hatch, which has a cover hinged to the rear. The commander and gunner sit on the right, and the loader on the left. The commander's cupola has eight periscopes and a hatch cover opening to the rear. The loader's cupola is a little higher, which restricts the commander's area of observation. The commander operates a split image coincidence x8 rangefinder. The gunner also has a periscope. Unlike most other contemporary tanks, the turret has no bustle.

The rear engine is separated by a fireproof bulkhead. It takes about an hour to remove the complete powerpack, consisting of engine, auxiliary engine, transmission, cooling, and exhaust system. A German engine is coupled to a Swiss transmission with six forward and two reverse gears. There are six rubber-tired, independently sprung road wheels. There are three track return rollers. The cast-manganese tracks have no rubber pads.

Standard equipment includes an NBC system, hull escape hatch, and a drinking water tank. Deep fording capability is not provided.

A newer PZ 61 AA9 has a dry-air filter, an SE-412 radio, and coaxial 7.5-mm machine gun.

(b) Pz 68. This model incorporated a stabilization system allowing the main gun to engage targets accurately while the tank is moving. On the left side of the turret is an ammunition resupply hatch. It has a more powerful engine and modified transmission, wider tracks with replaceable rubber pads, and more track contact with the ground. On the rear of the turret is a large stowage basket. Deep fording equipment can be installed.

The main 105-mm gun has a fume extractor but no muzzle brake. An illuminating rocket with a range of 1,300 meters can be launched from a system with 12 projectiles on the turret roof between the commander's and loader's cupolas.

#### **Measurements**

	<u>Pz 61</u>	<u>Pz 68</u>
<u>Combat Weight</u>	38,000 kg	39,700 kg
<u>Hull length</u>	6.78 meters	6.88 meters
<u>Hull width</u>	3.08 meters	3.14 meters
<u>Overall height</u>	2.85 meters	2.88 meters
<u>Ground clearance</u>	0.42 meters	0.41 meters
<u>Track</u>	2.59 meters	2.59 meters
<u>Track width</u>	500mm	520mm
<u>Track length on ground</u>	4.13 meters	4.43 meters
<u>Max road speed</u>	55 km/h	55 km/h
<u>Fuel capacity</u>	760 liters	710 liters
<u>Maximum road range</u>	300 km	350 km

#### **Armor**

Armor on the Pz 61 and Pz 68 varies from 15mm to 120mm.

(4) Vehicle Capabilities. The Pz 61 and Pz 68 can

- cross a 2.6-meter trench.
- mount a 0.75-meter vertical step.
- climb a 60-percent grade.
- ford 1.1 meters.

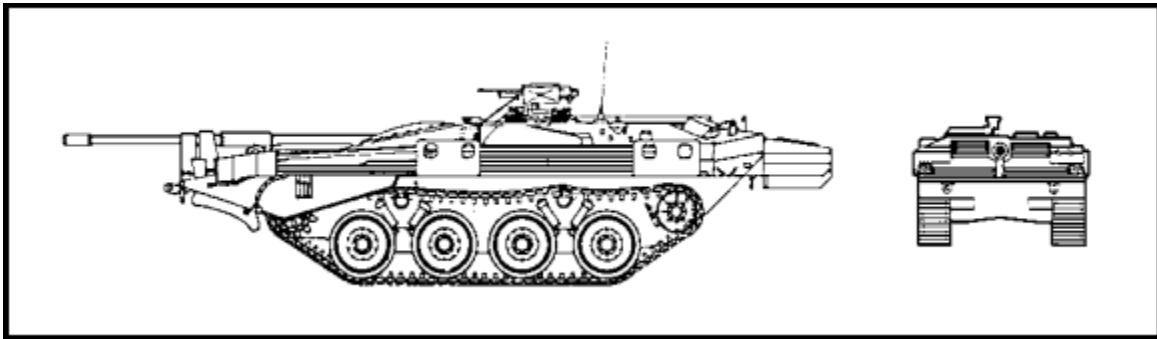
(5) Armament Characteristics. The main and secondary armament of the Pz 61 and the Pz 68 are discussed in the following subparagraphs.

(a) Main Armament. The main armament is a Swiss 105-mm gun known as the Pz Kan 61. It can fire a Swiss-designed high explosive round, an Israeli APFSDS, APDS, HESH, and smoke rounds. The gun control system is similar to that used on the French AMX30.

(b) Secondary Armament. A 7.5-mm MG 51 machine gun is mounted in front of the loader's hatch. Coaxial to the main gun is a 20-mm cannon.

(6) Countries Served. The Pz 61 and Pz 68s are only used in Switzerland.

p. STRV-103 (S-Tank) Main Battle Tank (Figure 1-13). This turret-less tank has a fixed gun that is elevated and traversed by altering the pitch of the hull and turning the whole vehicle. Named the Stridsvagn 103, Bofors designed an external crowbar steering system, adjustable hydro-pneumatic suspension system, and automatic loading system. Newer vehicles have a flotation screen for amphibious operation and a dozer blade.



**Figure 1-13. Bofors Strv 103B Main Battle Tank.**

(1) Variants. The variants of the S-tank are discussed in the following subparagraphs.

(a) S-Tank Modernization Program. All vehicles are having the Rolls-Royce K60 engine replaced by a Detroit Diesel 6V-53T that develops 290 horsepower. They are also being fitted with a new transmission, electronics, radiators, generator, silencer, laser rangefinder, computer, and fuel cans along the sides of the tank to increase range and protection.

(b) S-Tank With Mine Clearing Rollers. The first Swedish-developed mine-clearing rollers were delivered in 1989. Tests showed that they can detonate 15 to 20 heavy anti-tank mines at the same time as continuing to breach mines across the same clearing width.

(2) Recognition Features. Obviously, the most distinguishing feature of the STRV-103 is the fact that it has no turret. A series of horizontal ribs on the glacis plate is for deflecting armor-piercing hits. Some key features of the S-tank are:

- No turret.
- Fully tracked.

- Four large road wheels.
- Long, sloping nose plate, giving a wedge appearance.
- Bore evacuator at the middle of the main gun barrel, near the mantle.
- Dozer blade folded under tank nose.
- Low hull.

(3) Vehicle Characteristics. The S-tank has an all-welded hull holding the engines and transmission at the front, and magazines at the rear. Two engines are geared together; the diesel normally used all the time, and the gas turbine used only when in action. The gas turbine also can be used for cold-weather starting, or when the diesel is not working. The engine compartment has two fire extinguishers. The glacis plate and the main gun must be removed before the engine can be changed. The process takes about four hours.

The commander is on the right side of the tank, slightly to the rear of the radio operator. The commander has four periscopes and a combined periscope and binocular sight which is not operated with a laser rangefinder. The sight is stabilized in elevation. The cupola is stabilized in azimuth and can be traversed through 208 degrees. After locating a target, the commander uses handle bars on tiller columns to lay the tank onto the target. He selects ammunition type and fires the main gun. When firing the main gun, the suspension is locked for a more stable platform.

The driver also lays and fires the main gun. He sits on the left side of the hull and has a combined periscope and binocular sight to his front and a single periscope to the left. A laser rangefinder works through the sight also. Behind the driver is a radio operator who has a single-piece hatch cover, two periscopes, and controls to drive backwards if necessary. The fighting compartment has a hull-escape hatch.

All periscopes and sights have armored shutters to protect against shell splinters and prevent giving away the S-tank's position by sun glinting on its periscopes.

The first and fourth road wheels are on leading arms, while second and third are on trailing arms. A dozer blade folded under the nose can be secured by two rods after swinging forward through operating the hydro-pneumatic suspension. The S-tank is prepared for, but has no NBC system.

A flotation screen is erected from around the top of the hull in 15 to 20 minutes. The tank then propels through the water with its tracks at 6 km/h. When amphibious, the driver stands on top in the rear with a remote throttle control. He steers with reins attached to the main tiller.



## Measurements

<u>Combat weight</u> , 39,700 kg	<u>Track width</u> , 670mm
<u>Hull length</u> , 7.04 meters	<u>Track length on</u>
<u>Total height</u> , 2.43 meters	<u>ground</u> 2.85 meters
<u>to cupola top</u> , 2.14 meters	<u>Road speed</u> , 50 km/h
<u>Width</u> , 3.63 meters	<u>Water speed</u> , 6 km/h
<u>Ground clearance</u> , 0.4 meters	<u>Fuel capacity</u> , 960 liters
<u>Track</u> , 2.6 meters	<u>Road range</u> , 390 km

(4) Vehicle Capabilities. The STRV-103 can

- cross a 2.3-meter trench.
- mount a 0.9-meter vertical step.
- climb a 60-percent grade.
- ford 1.5 meters.
- become amphibious with the installation of the flotation screen.

(5) Armament Characteristics. The armament of the S-tank is discussed below.

(a) Main Armament. The main armament is a 105-mm rifled tank gun 62 calibers long. It has a bore evacuator, but no muzzle brake. The L74 mainly is a longer version of the British L7 series found on many other tanks. The gun is loaded from a rear magazine that holds 50 various armor-piercing or high-explosive rounds in 10 racks. The magazines are filled through two hatches in the rear in about 10 minutes. An automatic loader allows the gun to fire at a rate of 15 rounds per minute. Empty cartridge cases are automatically ejected outside the hull.

(b) Secondary Armament. Mounted similar to the main gun on the left side of the hull are two fixed 7.62-mm machine guns that fire alternately. When empty, they have to be reloaded by someone leaving the vehicle. To the left of the commander's cupola is an anti-aircraft 7.62-mm machine gun which can be aimed and fired from within. Two Bofors Lyran launchers on the roof are for target illumination at night.

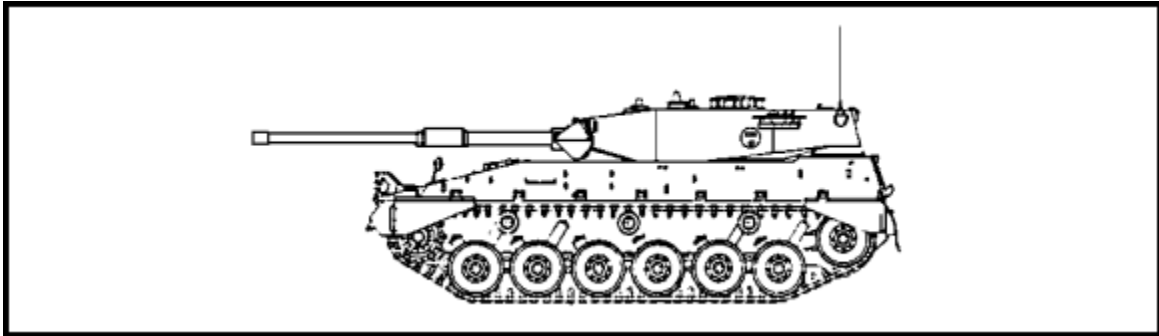
(6) Countries Served. The S-tank is in service only with the Swedish Army.

## 2. Thyssen Henschel THE 301 Medium Tank.

The following subparagraphs present information on only one medium tank. It is the Thyssen Henschel THE 301 (TAM) tank.

The Tanque Argentino Mediano (TAM) was developed for the Argentinean Army by Thyssen Henschel of Germany. According to Thyssen Henschel, the TAM is superior to the Leopard 1 in firepower and

mobility. Argentina's main reason to develop a tank in the 30-ton range rather than the normal 40- to 50-ton range was that many bridges and roads in South America could not stand up to the heavier tanks. [Figure 1-14](#) shows the TAM tank without detachable rubber side skirts or the LLTV camera.



**Figure 1-14. Thyssen Henschel THE 301 (TAM) Medium Tank.**

a. Variants. There were several variants of the TAM, some of which were never placed into production.

(1) Infantry Combat Vehicle. Argentina considered it an advantage to have to have a tank and an infantry combat vehicle based on the same chassis with resulting logistical, training, and economic advantages.

(2) TAM 4. This tank is externally very similar to the THE 301. It has significant differences in the powerpack and fire control system. The TAM 4 has a Rheinmetall 105-mm main gun and fires all standard 105-mm ammunition. The main armament is fully stabilized in both planes. For engaging targets at night there is an LLTV camera mounted on the mantlet which moves in elevation with the main armament. Both the commander and the gunner have a TV monitor which displays a second set of electronically generated cross-hairs superimposed on the TV picture.

(3) 155-mm Self-Propelled Gun (SPG). Argentina placed an order for 25 155-mm turrets which will be installed on lengthened TAM chassis. They will have seven road wheels on each side instead of six.

(4) 30-mm Self-Propelled Anti-Aircraft Gun. This system, called the Dragon, consists of the TAM chassis fitted with a French Thomson-CSF turret with twin 30-mm cannon.

b. Recognition Features. The TAM is based on the Marder infantry combat vehicle chassis. It has the following features:

- Six evenly spaced road wheels.
- Drive sprocket in the front and idler in the rear.
- 105-mm main gun.
- Turret set to the rear of the chassis.
- Well sloped glacis plate.

- Two fuel drums can be mounted on the rear of the tank.

c. Vehicle Characteristics. An all-welded hull has a well-sloped glacis plate for protection against small-arms fire, shell splinters, and up to 40-mm armor piercing rounds.

The driver sits in the front left and has a conventional steering wheel. His hatch cover opens to the right and he has three periscopes. One escape hatch is in the floor, and another in the rear. On the right of the driver is the engine. The glacis plate hinges on the right for maintenance access.

An all-welded turret mounted to the rear of the vehicle holds the commander and gunner on the right, and loader on the left. The commander has eight periscopes, and operates a coincidence rangefinder. In front of his hatch is a non-stabilized panoramic telescopic day or infrared night sight. Forward and below him is the gunner who has a sight combined with a swivelling and tilting periscope. The loader has a hatch opening to the rear, and a tilting periscope in front. On the left side of the turret is a small ammunition loading hatch. At the hull rear is another hatch for emergency exit or rapid reload of ammunition.

A super-charged MTU MB 833 Ka 500 six-cylinder diesel engine develops 720 horsepower at 2,200 rpm. The front sprocket drives Diehl tracks with removable rubber pads. The tops of the tracks may be covered with detachable rubber skirts. There are six rubber-tired road wheels and three track return rollers.

Standard equipment includes an NBC system, combustion heater for both cold engine starts and the crew compartment, electric bilge pumps, and a manual or automatic fire-extinguishing system. Optional equipment may be additional armor, radios, and intercoms. Key specifications are as follows:

#### **Measurements**

<u>Combat weight</u> , 30,500 kg	<u>Track length on ground</u> , 3.9 meters
<u>Hull length</u> , 6.77 meters	<u>Road speed</u> , 75 km/h
<u>Total height</u> , 2.42 meters	<u>Road range</u> , 550 km
<u>Width</u> , 3.12 meters	<u>with aux tanks</u> , 900 km
<u>Track</u> , 2.62 meters	<u>Fuel capacity</u> , 650 liters
<u>Track width</u> , 500mm	

d. Vehicle Capabilities. The THE 301 tank can

- cross a 2.9-meter trench.
- mount a 0.9-meter vertical step.
- climb a 60-percent grade.
- climb a 30-percent side slope.
- ford 1.4 meters without preparation.
- ford 2.25 meters with preparation.
- ford 4 meters with snorkel.

e. Armament Characteristics. The main and secondary armaments are discussed below.

(1) Main Armament. The main armament is either a 105-mm gun developed in Argentina or a Rheinmetall Rh 105-30. Both fire standard 105-mm tank ammunition. The gun has a bore evacuator, thermal sleeve, and is fully-stabilized. The TAM carries 50 rounds, 20 of them in the turret.

(2) Secondary Armament. Mounted coaxially to the main gun is a 7.62-mm machine gun made in Argentina. Another one on the roof can be used on slow or low-flying aircraft. On either side of the hull are four smoke dischargers.

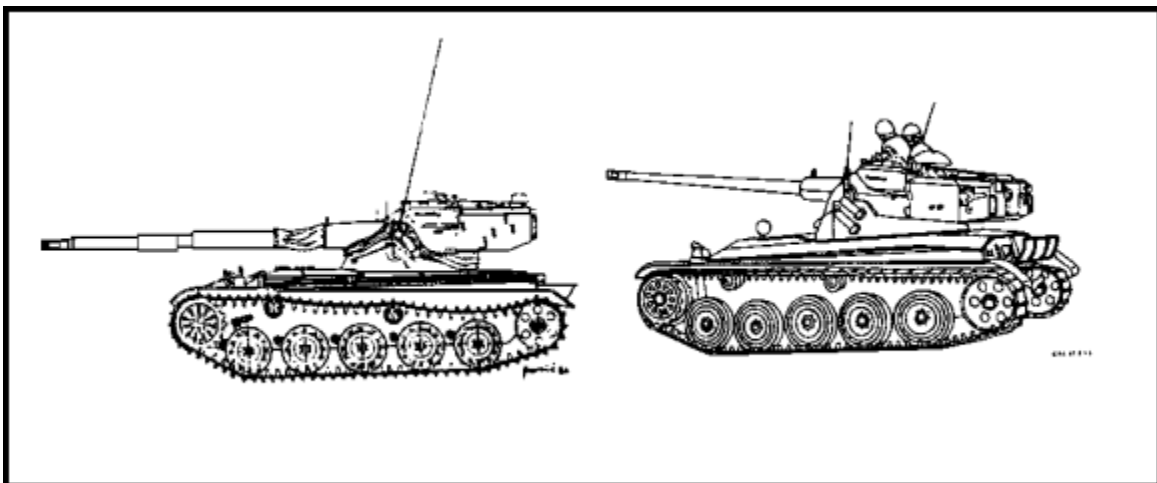
f. Countries Served. The THE 301 has been tested by Malaysia, Thailand, and Ecuador, but Argentina remains the only country using them.

### 3. Light Tanks.

There are a number of friendly light tanks. They each have individual characteristics and differences in capabilities. This subcourse presents information on three light tanks. They are--

- AMX 13 light tank.
- M41 light tank.
- M551 light tank/reconnaissance vehicle.

a. AMX 13 Light Tank (Figure 1-15). Since 1952 France has produced over 3,000 of these light battle tanks with numerous modifications. New production vehicles incorporate a new hull front, new diesel engine, automatic transmission, and hydro-pneumatic suspension. The basic chassis has been used for a mechanized infantry combat vehicle, a 105-mm howitzer, a 155-mm gun, and a twin 30-mm anti-aircraft gun system. By adding HOT missiles, the AMX 13 can be used as a tank destroyer. Because of its light weight it may be considered as a useful air-portable reconnaissance vehicle.



**Figure 1-15. AMX 13.**

(1) Variants. There are numerous variants of the AMX 13. The following subparagraphs provide information about the variants.

(a) 75-mm Main Gun. This first model of the AMX 13 was armed with a 75-mm gun with a single baffle muzzle brake. It is fed from two revolver type magazines, each holding six rounds. When fired, the empty cartridge is ejected out the rear of the turret through a trap door. One round can be fired every five seconds. When empty, the magazines are refilled by hand from outside the tank. It fires armor-piercing and high-explosive rounds, with an APFSDS under development.

Mounted to the right is a 7.5-mm or 7.62-mm machine gun, with another often mounted externally to the commander's position. The vehicle generally carries 37 rounds of 75-mm and 3,600 rounds (in belts of 200) of machine gun ammunition. Also two electrically-operated smoke dischargers are on either side of the turret.

(b) 90-mm Main Gun. This gun barrel is fitted with a thermal sleeve and a single baffle muzzle brake. It fires armor piercing, canister, HEAT, and smoke. A regunning package incorporates turret modifications for two six-round ammunition drums and turret basket ammunition racks with an automatic loading system.

The turret also has a coaxial machine gun, with another at the commander's position. The tank carries 34 rounds of 90-mm ammunition (21 in the turret, of which 12 are in the magazines) and 3,600 machine gun rounds.

(c) 105-mm Howitzer Main Gun. This gun fires the same non-rotating rounds as the AMX 30 MBT except with smaller and lighter propellant.

(d) FL-15 Turret. Special observation equipment includes seven M554 periscopes and two OB44 night observation binoculars for the commander. The gunner has two M556 telescopes. There is a laser rangefinder on the roof. The fire control equipment results in more effective target acquisition, engagement, increased probability of a first-round hit.

(e) 75-mm Gun in FL-11 Turret. This gun is identifiable by absence of rear turret overhang. It has a manually loaded 75-mm gun.

(f) Model 51 with 75-mm Gun and SS-11 Missiles. Two wire-guided anti-tank missiles are mounted on each side of the main armament. The missiles have a range of between 350 and 3,000 meters and the warheads can penetrate 600mm of armor.

(g) Model 51 with 75-mm Gun and HOT Missiles. The missiles are located in three launcher boxes on either side of the turret.

(h) Argentinean AMX 13s. Most of these have probably had their original gasoline engines replaced by diesels.

(i) Creusot-Loire Industrie AMX 13 Version 1987 with 105-mm Gun. The current production models of these tanks are improved in armor, mobility, and fire power. They have a new hull front with improved ballistic protection. Sand guards have been added to help keep down the dust. A 105-mm gun is standard. There is a choice of two diesel engines. They give the tank a road speed of 65 km/h. A new cooling system enables the engine to operate in high ambient temperatures. The automatic Fives Cail Babcock FL-15 turret has a 105-mm gun which can fire many types of ammunition, including APFSDS.

(j) Ecuadorian AMX 13s. The Ecuadorian AMX 13s have a fire control system which includes a laser rangefinder and its control unit, a digital computer that calculates the firing elevation, and a module that injects an aiming graticule into the gunner's original sight. There is a kit available to allow the 105-mm gun to fire APFSDS ammunition.

(k) Singapore AMX 13s. Singapore Automotive Engineering has developed its own repower package with a diesel engine. Other improvements include an automatic gun loading system and a hydro-pneumatic suspension unit.

(l) Venezuelan AMX 13s. These tanks have a 90-mm main gun. They are fitted with a diesel engine and a new cooling system.

(m) Venezuelan AMX 13 Rocket Launchers. Venezuela has about 25 AMX 13 light tank chassis with the turrets replaced by an Israeli 160-mm local acquisition radar (LAR) multiple rocket launcher system.

(n) AMX 13 with Laser Rangefinder. The laser rangefinder is mounted externally behind the gunner. It has a range of between 400 and 9,995 meters.

(o) NIMDA Upgrade for AMX 13. NIMDA, an Israeli company, produces a complete retrofit package for the AMX 13 light tank. The package consists of a new diesel engine, a new automatic transmission, new armament, computerized fire control system, additional armor protection, and a fire/explosion detection and suppression system.

(p) AMX 13 ARV. The AMX 13 ARV is used to recover other members of the AMX 13 family, and for changing major components such as turrets and engines. The ARV is equipped with a front-mounted A-frame, a 15,000 kg capacity winch, a secondary winch, four spades at the rear of the hull, tools, and other equipment. The ARV has a crew of three. The armament consists of an externally-mounted 7.5-mm or 7.62-mm machine gun and smoke dischargers.

(q) AMX 13 Bridgelayers. The bridgelayers are fitted with a folding class 25 bridge which has an unfolded length of 14.01 meters. The bridge is launched over the rear of the vehicle and two stabilizers steady the vehicle while the bridge is being positioned. The ARV has a loaded weight of 19,700 kg.

(2) Recognition Features. The AMX 13 has a driver's and engine compartment at the front. A small turret is set well to the rear, with a large flat overhang. The top half of the two-piece turret oscillates to elevate the gun. The AMX 13 also has these features:

- Low, square hull.
- Fully tracked chassis.
- Five road wheels with support rollers.
- Steeply sloped front armor.
- Elongated turret with pronounced rear overhang.
- Turret hinged in the center for elevating and depressing the gun (oscillating turret).
- Low-silhouetted hull with a flat-faced turret mounted over the third and fourth road wheels.
- No bore evacuator.
- Blast deflector at the muzzle.

(3) Vehicle Characteristics. The driver sits to the left with three periscopes and a hatch cover opening to the left. The commander sits to the left of the turret, has eight periscopes and a domed hatch cover that opens to the rear. The gunner has two periscopes and a single-piece hatch cover opening to the rear. A torsion-bar suspension has five rubber-tired road wheels with the drive sprocket at the front. Steel tracks have 85 links that can be fitted with rubber pads.

An add-on armor package can be installed or removed by the crew with on-board tools. The package is installed on the turret front and sides and on the nose and glacis plate of the hull. This protects against 20-mm armor-piercing projectiles fired from a range of 100 meters over a 180-degree arc.

This tank does not have an NBC system. It cannot be fitted for deep wading. It was not built for night fighting, although some armies have fitted an infrared searchlight to the rear of the gunner's position and an infrared sight for the gunner. Recently the AMX 13 has been produced with passive or thermal night firing and night driving equipment, laser rangefinder, and automatic display of the battle sight.

### **Measurements**

<u>Combat Weight</u> , 15,000 kg	<u>Track width</u> , 350mm
<u>Hull length</u> , 4.88 meters	<u>Track length on ground</u> , 2.997 meters
<u>Hull width</u> , 2.51 meters	<u>Max road speed</u> , 60 km/h
<u>Overall height</u> , 2.3 meters	<u>Fuel capacity</u> , 480 liters
<u>Ground clearance</u> , 0.37 meters	<u>Maximum road range</u> , 350-400 km
<u>Track</u> , 2.159 meters	

## **Armor**

### Hull Thickness

Front, 15mm

Sides, 20mm

Top, 10mm

Rear, 15mm

### Turret Thickness

Front, 25mm at 45 degrees

(equal to 40mm)

Sides, 25mm

Top, 10mm

(4) Vehicle Capabilities. The AMX 13 can

- cross a 1.6-meter trench.
- mount a 0.65-meter vertical step.
- climb a 60-percent grade.
- climb a 60-percent side slope.
- ford 0.6 meters.

(5) Armament Characteristics. The following subparagraphs describe the main and secondary armament.

(a) Main Armament. The AMX 13 main armament can be a 75-mm gun, a 90-mm gun, or a 105-mm gun. The ammunition used depends upon which gun is mounted on the tank.

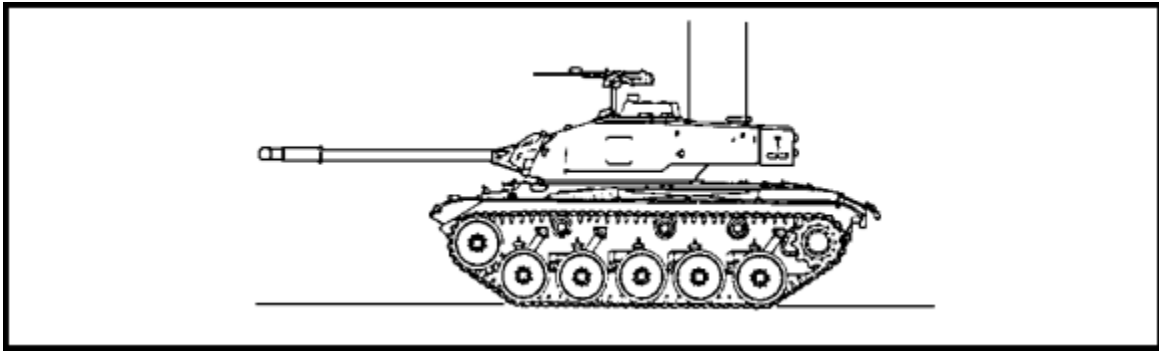
(b) Secondary Armament. A 7.5-mm or a 7.62-mm machine gun is mounted coaxially to the right of the main armament. A similar weapon is often mounted externally at the commander's position. In addition, there are two electrically operated smoke dischargers on either side of the turret.

(6) Countries Served. Nations using the AMX 13 include:

Algeria	France	Peru
Argentina	India	Singapore
Austria	Indonesia	Switzerland
Belgium	Ivory Coast	Tunisia
Cambodia	Lebanon	Venezuela
Dominican Republic	Morocco	
Ecuador	Netherlands	

b. M41 Light Tank (Figure 1-16). This light tank with a stabilized 76-mm automatic gun was designed to replace the M24 Chaffee after World War II. Improvements included cast and welded turret, new mantlet, redesigned ammunition stowage, new fire control system, stabilization system, and automatic lead computer. The M41 Walker Bulldog was named for General W. W. Walker who was killed in Korea.





**Figure 1-16. M41 Light Tank.**

(1) Variants. There are several variants of the M41. The following subparagraphs discuss them.

(a) The M41A2 is the same as the M41A1 except for a simplified turret and gun control system. This has manual and hydraulic power traverse for the gunner, dual power traverse by the commander, and manual mechanical elevation for the gunner. The more compact system allows 65 rounds instead of 57 rounds of 76-mm ammunition to be carried. The M41A2 and M41A3 also have a fuel injected engine.

(b) Cadillac Gage Turret Modernization system (TMS). A TMS for the M41 can be fitted by the user. Advantages are improved low-speed tracking and target acquisition, high precision gun positioning capability, improved first round hit capability, reduced system weight and volume, simplified system operation and maintenance, simplified overall logistical support, readily available spare parts, increased reliability, and high system growth potential. It also can be fully stabilized for firing on the move.

(c) Brazilian M41. In this version, the original 500 HP gasoline engine has been replaced by a diesel engine. To accommodate the engine, the rear hull has been enlarged and a new cooling system has been installed. The first 20 M41Bs retain the original 76-mm M32 gun. The following 120 to 200 M41Bs were fitted with the M32 gun bored out to fire the same 90-mm ammunition as the Cockerill 90-mm, which is used on other Brazilian armored vehicles. Since 1984, all rebuilt M41s have been equipped with the 90-mm gun. They also have a muzzle brake and bore evacuator. They can fire an APFSDS round. This tank also has a thermal sleeve for the 90-mm gun, side skirts, and additional spaced armor for the forward part of the hull, glacis plate, and turret. Four smoke dischargers are mounted on each side of the turret. Night vision equipment and a laser rangefinder can also be installed. The upgraded engine and transmission provide a maximum road speed of 70 km/h.

(d) Spanish M41. The Spanish Army has 127 M41 light tanks in service and approximately 120 in reserve. Of these, 100 may be converted to anti-tank use.

These will be equipped with either the Euromissile turret with four high subsonic optically tracked (HOT) anti-tank guided missiles (ATGM) in the ready-to-launch position or the improved tube-launched, optically tracked, wire-guided missile (TOW). The remainder will be upgraded with a new powerpack, which gives a maximum road speed of 72/km/h.

(e) M41 German Tank Improvement (GTI). This program replaces the original gasoline engine with a diesel. The new engine and increased fuel capacity increase the range from 161 km to 600 km on roads. Quick disconnect couplings allow the rapid removal of the complete powerpack. Other modifications include a new fire suppression system, suspension, tracks, skirts, an electric turret drive system, a laser rangefinder, smoke dischargers, NBC protection system, radios, and intercom. Six electrically-operated smoke dischargers are mounted on either side of the turret. These smoke dischargers can also fire fragmentation grenades.

(f) M41 with Cockerill LCTS 90 Turret. This two-man power-operated turret is designed for a Cockerill 90-mm Mk 7 gun, a 7.62-mm coaxial machine gun, optional 7.62-mm anti-aircraft machine gun, and two banks of smoke dischargers.

(g) NIMDA Upgrade Package for M41. An Israeli company retrofits the M41 with an Israeli 60-mm weapon system, advanced fire control systems and optics, improved protection, new engine, and suspension.

(2) Recognition Features. The M41 light tank is used by several nations, and there are several variants. Some key recognition features are listed below.

- Five evenly spaced road wheels.
- Three track return rollers.
- Drive sprocket in the rear and idler in the front.
- Turret sits well forward on the hull.
- Elongated bustle.

(3) Vehicle Characteristics. The driver sits at the front, left side of the all-welded steel hull. Three periscopes are mounted in front of the driver, and another one to his left. Beneath the driver's seat is a hull escape hatch.

The commander and gunner sit on the right, and the loader on the left. A hatch cover opens forward of the commander's cupola, which has five vision blocks and a 360-degree traversable periscope. Another periscope that can be traversed 360 degrees is provided for the gunner.

The gunner also has a telescopic sight for aiming the 76-mm gun. The loader has a single periscope and a hatch cover that opens forward. A light sheet-metal stowage box is mounted on the turret rear. A dome-shaped ventilator is on the turret roof toward the rear. The driver operates the ventilator blower.

The M41 is divided into three compartments. The driver's compartment is at the front, the fighting compartment is in the center, and the engine compartment is at the rear.

Standard equipment on all M41s includes a heater, deep fording equipment, and electric bilge pumps. The M41 is not equipped with an NBC system.

### **Measurements**

<u>Combat Weight</u> , 23,495 kg	<u>Track</u> , 2.602 meters
<u>Hull length</u> , 5.819 meters	<u>Track width</u> , 533mm
<u>Hull width</u> , 3.198 meters	<u>Track length on ground</u> , 3.251 meters
<u>Overall height</u> , 3.075 meters	<u>Fuel capacity</u> , 530 liters
<u>Ground clearance</u> , 0.45 meters	<u>Maximum road speed</u> , 72 km/h

### **Armor**

<u>Hull Thickness</u>	<u>Turret Thickness</u>
<u>Glacis</u> , 25.4mm	<u>Mantlet</u> , 38mm
<u>Nose</u> , 31.75mm	<u>Front</u> , 25.4mm
<u>Top</u> , 12/15mm	<u>Sides</u> , 25mm
<u>Rear</u> , 19mm	<u>Rear</u> , 25mm
	<u>Roof</u> , 12.7mm

(4) Vehicle Capabilities. The M41 can

- cross a 1.828-meter trench.
- mount a 0.711-meter vertical step.
- climb a 60-percent grade.
- climb a 30-percent side slope.
- ford 1.016 meters without preparation.
- ford 2.44 meters with preparation.

(5) Armament Characteristics. The M41 main and secondary armament is discussed in the following subparagraphs.

(a) Main Armament. The M41 has a 76-mm gun. It fires blank, canister, smoke, and various high-explosive antitank, or high-velocity armor-piercing rounds.

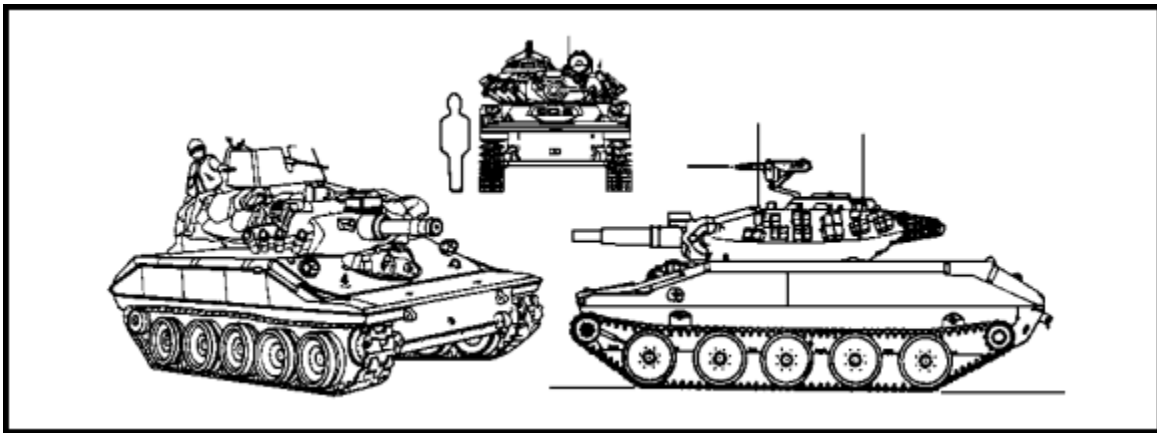
(b) Secondary Armament. Mounted coaxially to the main gun is a 7.62-mm (30-cal.) Browning M1919A4E1 machine gun. At the commander's position is an anti-aircraft 12.7-mm (50-cal.) Browning M2 HB machine gun.

(6) Countries Served. M41s are in service with the following countries.

Brazil	Greece	Taiwan
Chile	Guatemala	Thailand
Denmark	Philippines	Tunisia
Dominican	Somalia	Uruguay
Republic	Spain	
Ethiopia	Sudan	

c. M551 Sheridan Light Tank/Reconnaissance Vehicle ([Figure 1-17](#)). Originally designated the Armored Reconnaissance/Airborne Assault Vehicle (AR/AAV). It was originally intended as a fully-amphibious main reconnaissance weapon for armor, infantry, and airborne operations. It was assigned to the Rapid Deployment Force of the 82nd Airborne Division.

When deployed to Vietnam there were deficiencies with the engine, transmission, suspension, and its conventional round with a combustible cartridge case. The M551 Sheridan is now phased out of service except for some 330 of these light tanks assigned to the National Training Center at Fort Irwin where they are disguised as various aggressor force vehicles.



**Figure 1-17. M551 Light Tank/Reconnaissance Vehicle.**

(1) Variants. The variants of the M551 are discussed in the following subparagraphs.

(a) M551A1. This model is fitted with the Hughes AN/VVG-1 laser rangefinder in the forward part of the commander's cupola. A ruby laser, optics, and electronic panels give the commander an accurate range within seconds.

(b) M551 for ARMVAL. An Army/Marine Corps Advanced Anti-armor Vehicle Evaluation program modified 10 vehicles by reducing the weight to 11,340 kg. The tanks received a more powerful engine, new cooling system, and a modified cross-country suspension. Acceleration was from 1 to 48 km/h in 10 seconds. A German sighting system has a zoom daylight TV and laser gun simulator.

(c) M551 with 75-mm ARES cannon. An Elevated Kinetic-Energy Weapon Test Bed was built for a low-profile turret with a 75-mm ARES automatic cannon. The commander on the right has a 360-degree movable periscope. The gunner on the left has dual-sight periscopes.

(d) M551 with 105-mm gun. This version has a 105mm Low Recoil Force turret.

(2) Recognition Features. The Sheridan has a duckbill shaped nose and thick stubby main gun. The driver in the front has a hatch cover which swings inside the vehicle to his rear for driving with his head out. The cover has three integral periscopes each with a washer and wiper. Other recognition features are listed below.

- Five equally spaced road wheels.
- Drive sprocket in the rear and idler in the front.
- No track return rollers.
- Short, stubby main gun does not extend past the front of the hull.
- Turret mounted forward of center.
- The tank is amphibious with a flotation screen which takes five minutes to install.

(3) Vehicle Characteristics. The hull is all-welded aluminum armor. An all-welded steel turret holds the commander and gunner on the right, and loader on the left. All around the commander's cupola are ten vision blocks. The commander also has a x4 portable night-vision device. His split hatch cover opens left and right.

Below and in front of the commander is the gunner, who has a telescope linked to the main gun. He has an infrared sight mounted on the roof. The loader's hatch cover opens to the right. Mounted in front of his hatch is a 360-degree traversable periscope. At the rear of the turret is a large wire stowage basket. Nine boxes strapped on the left, and six on the right, are for machine gun ammunition.

A six-cylinder water-cooled turbo-charged diesel engine develops 300 horsepower at 2,800 rpm. A cross-drive transmission has four forward and two reverse speeds.

There is no fire warning system, but a fire-suppression system in the engine compartment can be operated by the driver, or from outside the vehicle.

The Sheridan was originally intended to be fully amphibious without preparation, but a flotation screen was designed and takes about five minutes to fit around the top of the hull. The tracks propel the vehicle through the water.

Standard equipment is a heater, extraction fan in the turret roof, diesel cooker, and an NBC system that pipes fresh air to the crew's face masks from a central unit.

Some key specifications are:

### **Measurements**

<u>Combat Weight</u> , 15,830 kg	<u>Track width</u> , 444mm
<u>Length</u> , 6.299 meters	<u>Track length on ground</u> , 3.66 meters
<u>Width</u> , 2.819 meters	<u>Fuel capacity</u> , 598 liters
<u>Overall height</u> , 2.946 meters	<u>Maximum speed, road</u> , 70 km/h
<u>Ground clearance</u> , 0.48 meters	<u>Maximum speed, water</u> , 5.8 km/h
<u>Track</u> , 2.348 meters	

(4) Vehicle Capabilities. The M551 can

- cross a 2.54-meter trench.
- mount a 0.838-meter vertical step.
- climb a 60-percent slope.
- climb a 40-percent side slope.
- become amphibious in five minutes.

(5) Armament Characteristics. The main and secondary armament is described below.

(a) Main Armament. The M551 has the M81 155-mm gun/launcher with a concentric hydro-spring recoil system. It fires the Shillelagh missile or conventional rounds with a combustible cartridge.

The MGM-51A Shillelagh missile was produced in 1964 and was also launched from the M60A2 main battle tank. The missile is 1.155 meters long, weighs 26.76 kg, and has a velocity of 689 meters per second. A solid propellant motor burns for 1.18 seconds for an effective range of 2,500 to 3,000 meters. Depending on mission requirement, 8 Shillelagh missiles and 20 rounds of conventional ammunition are carried.

The well-trained gunner can launch two missiles a minute. He guides the missile by keeping cross-hairs of his sight on the target until impact. A missile tracker measures deviation of flight path from line of sight. Commands are transmitted to the missile from an infrared transmitter mounted in a small box over the main gun.

(b) Secondary Armament. The M551 has one coaxial 7.62-mm machine gun and one anti-aircraft 12.7-mm machine gun.

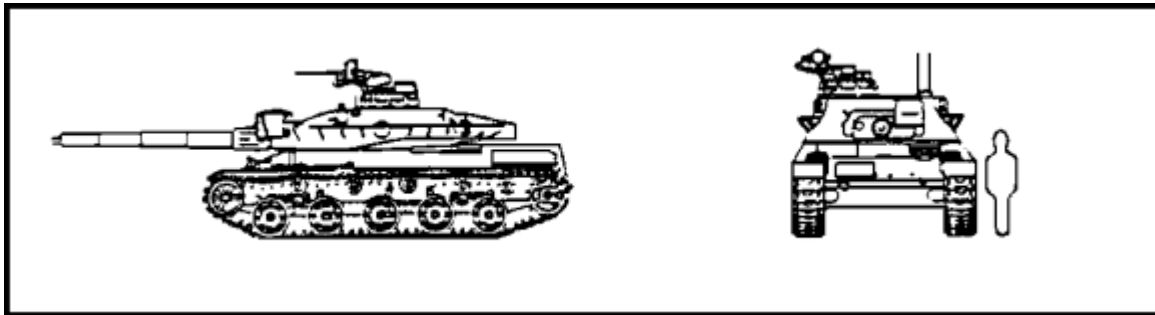
# Practice Exercise

## Lesson 1

**Instructions** The following items will test your understanding of the material covered in this lesson. There is only one correct answer for each item. When you have completed the exercise, check your answers with the answer key that follows. If you answer any item incorrectly, review that part of the lesson which contains the portion involved.

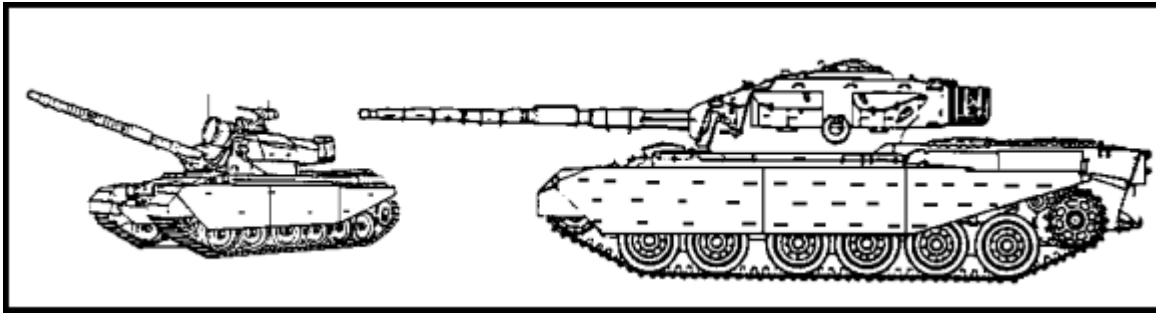
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Situation: You are an infantry officer on a United Nations mission overseas. It is vital that you can recognize the various friendly armored vehicles that could be employed in a combat situation. It is also important you know the firepower and mobility capabilities of your allies. Use this general situation to answer the questions in this practice exercise.



**Figure 1-18.**

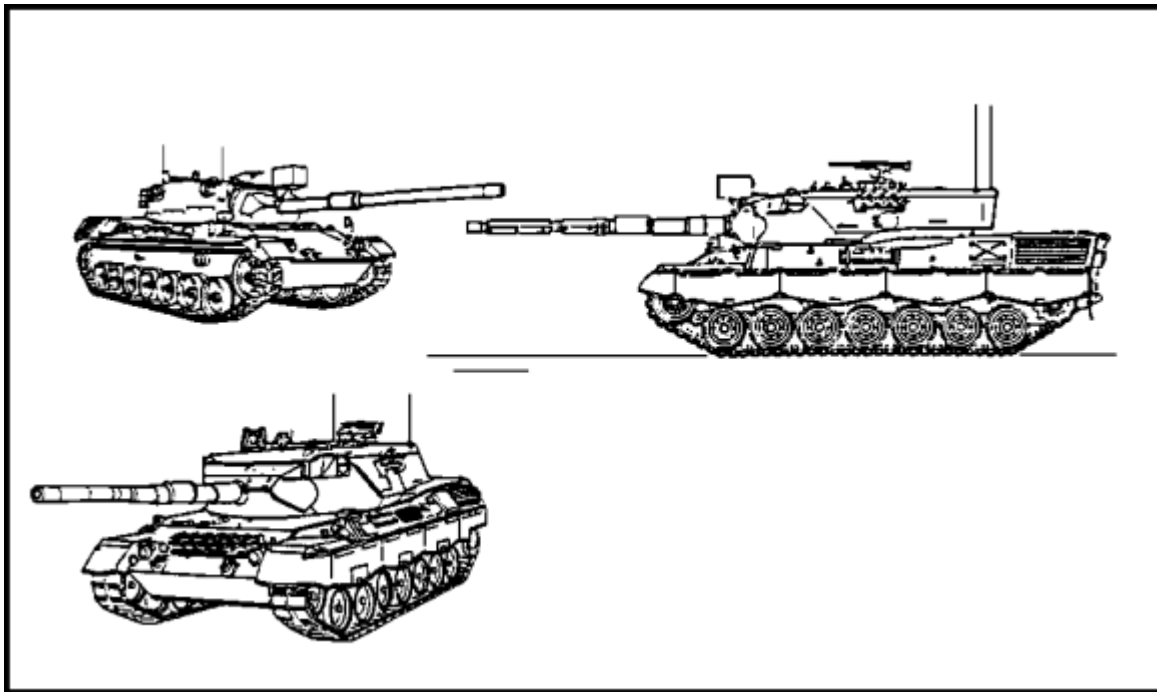
1. You are observing friendly operations and observe a number of tanks of the same type. They have a large, high-profile commander's cupola. You identify the vehicle (shown in Figure 1-18) as
  - ☐ A. AMX 30 MBTs.
  - B. Leopard 2 MBTs.
  - C. M1A1 MBTs.
  - D. M48 MBTs.
2. The main armament of the tank shown in Figure 1-18 is a
  - A. 70-mm rifled gun.
  - B. 90-mm smooth bore gun.
  - C. 105-mm rifled gun.
  - D. 120-mm smooth bore gun.



**Figure 1-19.**

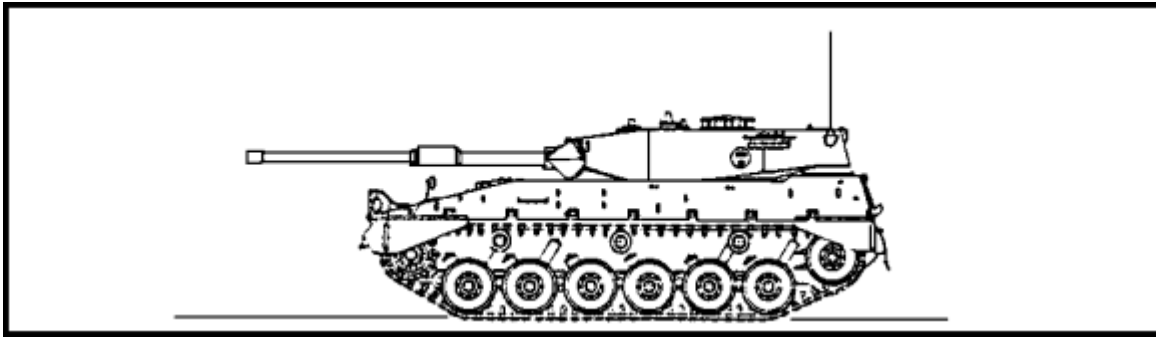
3. Enroute to an area of operations, you pass by a formation of friendly tanks as shown in Figure 1-19. You identify these tanks as
  - A. AMX 40 MBTs.
  - B. M60A1 MBTs.
  - C. PZ 61 MBTs.
  - D. Centurion MBTs.
4. A feature that helps you identify the tanks in the preceding question is
  - A. two large mufflers on each side of the rear deck.
  - B. the gap between the fourth and fifth road wheels.
  - C. the 90-mm main gun.
  - D. the small, oval mantle.





**Figure 1-20.**

5. Your mission requires you to be able to identify friendly armored vehicles. During a study period you see a picture of the tank shown in Figure 1-20. You identify the tank as a
  - A. Leopard 1 MBT.
  - B. Chieftain MBT.
  - C. Centurion MBT.
  - D. Bofors STRV 103 MBT.
6. What is the maximum effective range of the main armament of the tank pictured in Figure 1-20?
  - A. 1,700 meters.
  - B. 2,000 meters.
  - C. 2,200 meters.
  - D. 2,400 meters.



**Figure 1-21.**

7. During a field training exercise (FTX) with allied forces you observe the somewhat smaller tanks shown in Figure 1-21. You identify these tanks as
  - A. M1A1 MBTs.
  - B. PZ 61 MBTs.
  - C. THE 301 (TAM) medium tanks.
  - D. M41 light tanks.
8. Which of the following countries uses the tank shown in Figure 1-21?
  - A. Argentina.
  - B. Israel.
  - C. Morocco.
  - D. Turkey.

## Lesson 2

### LIGHT ARMORED VEHICLE IDENTIFICATION

#### OVERVIEW

##### LESSON DESCRIPTION:

In this lesson, you will learn to identify various friendly armored vehicles, including amphibious assault vehicles (AAVs), armored personnel carriers (APCs), infantry fighting vehicles (IFVs), light armored cars (LACs), reconnaissance vehicles (RVs), and scout cars (SCs). You will also learn their capabilities.

##### TERMINAL LEARNING OBJECTIVE:

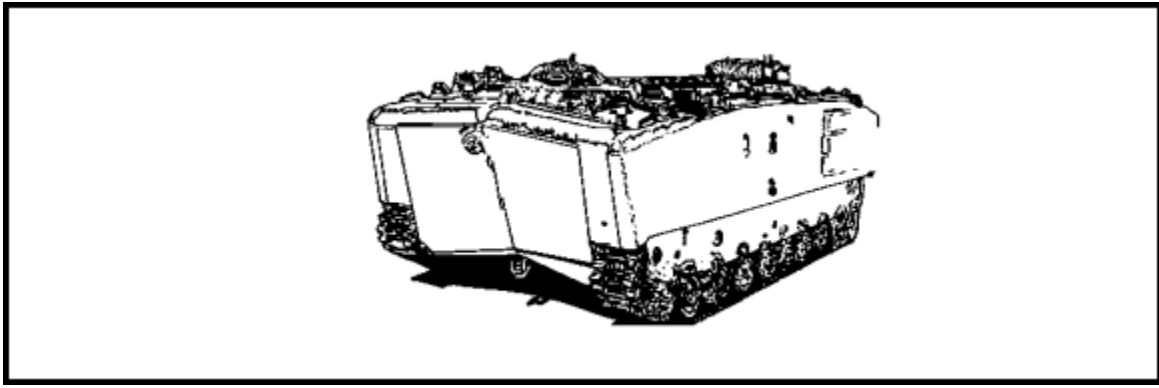
- Action: Identify friendly armored vehicles and their capabilities.
- Condition: You will be given the information contained in this lesson.
- Standard: Identification of friendly armored vehicles and their capabilities will be in accordance with the material contained in this lesson.
- References: The material contained in this lesson was derived from the following publications:
- FM 1-402  
Jane's Armoured and Artillery 1989-1990.

#### INTRODUCTION

The various friendly armored vehicles have distinguishing features, characteristics, and roles. Most have rear cargo and troop compartments for carrying infantrymen under protection from small-arms fire. Some have stabilized turrets and laser rangefinding, which provide for night fighting capability and high-speed firing on the move. Many are amphibious, and are propelled through the water by their tracks. Some have large, all-wheel drive, run-flat tires. Practically all are armed with machine guns. Many have main guns that fire new armor-piercing ammunition.

##### 1. LVTP5A1 Amphibious Assault Vehicle (U.S.) (Figure 2-1).

By 1957, 1,124 of these amphibians were built to replace World War II versions used by the Marine Corps. The Landing Vehicle, Tracked, Personnel, Model 5 (LVTP5) was designated LVTP5A1 when fitted with minor modifications including a box-type snorkel over the engine compartment. It was never considered a satisfactory design because of its short operating range and excessive maintenance. When a new vehicle by FMC called the LVTP7 entered service in 1971, the LVTP5 was phased out by 1974. Some were transferred to the Philippines and Taiwan, and recently bought by Chile.



**Figure 2-1. LVTP5A1 Armored Amphibious Assault Vehicle.**

a. Variants.

(1) LVTH6 (Landing Vehicle, Tracked, Howitzer, Model 6). These were fitted with a two-man turret with a 105-mm howitzer, a coaxial 7.62-mm machine gun, and .50-caliber anti-aircraft machine gun. When afloat, they carry 100 rounds of 105-mm, 1,000 rounds of 7.62-mm, and 1,050 rounds of .50-caliber ammunition.

(2) LVTC5 (Landing Vehicle, Tracked Command, Model 5). This is similar to the basic LVTP5 but the cargo compartment is equipped with additional communications equipment, tables, and mapboards. It has a command crew of nine, plus its normal crew of three. It is distinguishable from the basic vehicle by its additional radio antennas.

(3) LVTR1 (Landing Vehicle, Tracked, Recovery, Model 1). The LVTR1 is used for recovery and maintenance of other members of the LVTP5 family of vehicles. It is equipped with a generator, welding equipment, air compressor, a boom with a capacity of 3,175 kg, and a winch with a capacity of 20,412 kg. This model has no machine gun turret.

(4) LVTE1 (Landing Vehicle, Tracked, Engineer, Model 1). This had a special dozer blade in front, and a rocket-propelled mine-clearing system.

(5) Taiwanese LVTP5/LVTP6. A prototype program as of 1989 was to replace the gas engine with one of three diesel powerpacks tested in Taiwan.

b. Recognition Features. The LVTP5 has a barge-shaped hull with an inverted V-shaped bow for more efficient water operation. Other features include:

- Nine road wheels.
- Steel plated, hydraulic ramp in front.
- The driver sits at the front of the hull on the left and has four M17 periscopes, one M17C periscope, and a single piece hatch cover.
- The commander sits at the front of the hull on the right side and has the same number and types of periscopes as the driver.
- The machine gun turret is between and slightly forward of the commander's and driver's positions. The gunner has five vision blocks and an M25C periscope sight.

- Forward and on each side of the machine gun turret is a single M17 periscope facing forward.
- On each side of the hull is an emergency escape hatch and a single vision block.

c. Vehicle Characteristics. A rigid, watertight armor plate ranges from 6.35mm to 15.87mm thick. A steel-plated hydraulic ramp in front has heavy, water-tight rubber seals.

All openings for ventilation, bilge discharge and access are in the top deck. A cargo hatch over the troop compartment measures 2.438 meters long and 2.1 meters wide. It has two spring-loaded double folding sections hinged at the outer sides.

Four troop seats hold eight marines each. Another two sit on the machine gunner's platform for a total of 34. In an emergency, the vehicle can carry 45 standing marines. The LVTP5 can carry 5,443 kg of cargo when afloat, and 8,165 kg when on land. It may carry a 105-mm towed howitzer, its crew, and 90 rounds of ammunition.

The engine and transmission are in the rear. There is limited access via a hatch in the transverse bulkhead. The main engine hatch may be unbolted from the top deck to permit removing the complete powerpack.

There is a rear drive sprocket and five track return rollers. A pair of nine dual steel bogie wheels are suspended from rubber torsion spring assemblies. The vehicle is propelled in the water by its tracks. Each of 134 blocks has an inverted water grouser.

The LVTP5A1 has infrared, stretcher, navigation, and winterization kits available.

#### **Measurements**

<u>Crew</u> , 3	<u>Track length on ground</u> , 5.892 meters
<u>Passengers</u> , 34 (SITTING)	<u>Road speed</u> , 48.28 km/h
<u>Combat weight</u> , 30,144 kg	<u>Water speed</u> , 10.94 km/h
<u>Length</u> , 9.042 meters	<u>Fuel capacity</u> , 1726 liters
<u>Width</u> , 3.567 meters	<u>Range</u> , 306 km
<u>Height</u> , 2.565 meters (hull)	
<u>Track width</u> , 521mm	

#### **Armor**

<u>Ramp outer</u> , 9.52mm	<u>Floor</u> , 9.52-15.87mm
<u>Ramp inner</u> , 15.87mm	<u>Rear</u> , 9.52mm
<u>Sides</u> , 12.7-15.87mm	<u>Turret</u> , 9.52mm
<u>Top</u> , 6.37mm	

d. Vehicle Capabilities. The LVTP5 can

- cross a 3.657-meter trench.

- mount a 0.914-meter vertical step.
- climb a 70-percent slope.
- climb a 60-percent side slope.
- ford amphibiously.

e. Armament Characteristics. The LVTP5 carries a 7.62-mm machine gun and 2,000 rounds of ammunition.

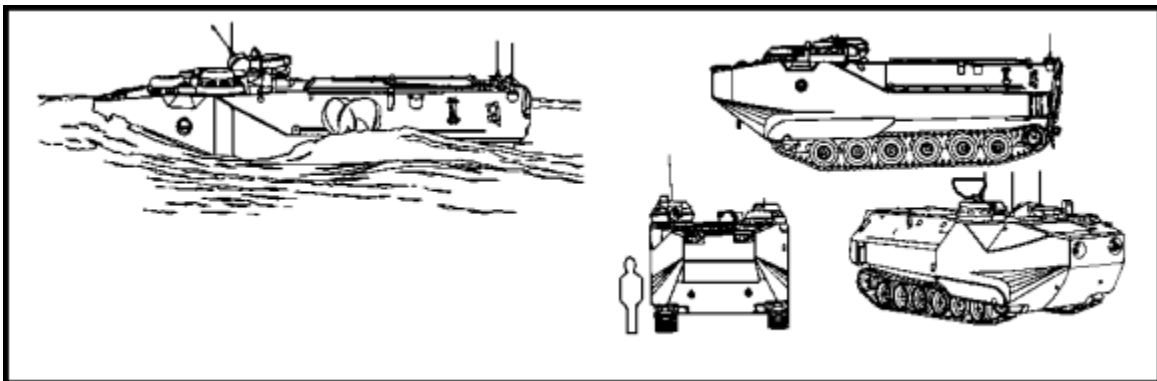
f. Countries Served. This vehicle is in service with Chile, the Philippines, and Taiwan.

## 2. AAV7A1 Amphibious Assault Vehicle (U.S.) (Figure 2-2).

This vehicle was originally called the landing vehicle, tracked, personnel 7 (LVTP7) and is still referred to by this designation by some users. In 1985, the U.S. Marine Corps changed this to the amphibious assault vehicle 7 (AAV7). All new production vehicles were built to the AAV7A1 configuration and existing vehicles were upgraded to the new production standard.

The AAV7A1 can be distinguished from earlier models by square headlamps recessed into the nose. The modernization emphasized increased reliability, availability, maintainability, and durability. The AAV7A1 designation included the following new standard items:

- Powerpack with Cummins VT400 engine.
- Off-board and on-board fault-isolation instrumentation.
- Smoke-generating capability.
- Passive night driving and night firing devices.
- Improved fire-suppression system.
- Secure voice radio installation.
- Mounting of Position Location and Reporting System (PLARS) system.
- Improved personnel ventilation.
- Improved hydraulic and electric system.
- Improved electric weapon station.
- Improved suspension.



**Figure 2-2. LVTP7 Amphibious Assault Vehicle.**

a. Variants. Forward deployed AAV7A1s and maritime pre-positioning assets have an add-on armor kit. This is a set of punched and perforated plates attached to the sides and sloping parts. Newer kits will have enhanced layers. Future AAV7A1s and variants may have a bow vane to improve amphibious capability, and an automatic fire suppression system.

(1) AAVC7A1 Command Vehicle. This vehicle is similar to the basic AAV7, except that its machine gun turret has been replaced by a simple hatch cover similar to that fitted at the driver's and commander's position. Armament consists of a pintle-mounted 7.62-mm M60D machine gun with 1,000 rounds of ammunition. This vehicle also has a navigation system. The loaded weight is 21,537 kg.

(2) AAVR7A1 Recovery Vehicle. This vehicle also has the machine-gun turret replaced by a 7.62-mm M60D machine gun. It carries benches, tools, air compressor, battery charger, generator, a MIG welder, and a portable welding kit. A hydraulic crane which can lift 2,722 kg is mounted on the roof. A 13,605kg recovery winch has 84.7 meters of cable. The recovery vehicle has a crew of five.

(3) AAV7A1 with Catapult Launched Fuel Air Explosive (CATFAE). This is an AAV7A1 series vehicle equipped with a CATFAE system in the rear troop compartment.

(4) AAV7A1 with 40-mm/12.7-mm Turret. The Marine Corps has bought 340 Upgunned Weapons Stations, which consists of a 40-mm grenade launcher and a 12.7-mm M2 HB machine gun that replaces the 12.7-mm M85 machine gun turret. A day/night/laser rangefinder sight has also been purchased for this turret.

b. Recognition Features. This subparagraph provides information on the recognition features of the AAV7A1.

- Prominent cupolas, one with a .50-cal machine gun.
- Driver's hatch cover in the front left.
- Six evenly spaced, rubber-tired, road wheels.
- Drive sprocket is at the front, and idler at the rear.
- No track return rollers.
- Commander's cupola behind the driver's.
- Box-like periscope in front of the commander's cupola.

The engine in front gets air from ballistic grills on the roof. Below the grills are hydraulic doors that seal when afloat. Then air is drawn in for the engine and troop compartment through a hydro-dynamically-actuated air valve on top to the right of the driver. A contact cooler is part of the hull floor.

c. Vehicle Characteristics. An all-welded aluminum hull provides protection from small-arms fire, shell splinters, and flash burns. There is a crew of three. In the rear are three bench seats for 25 fully-equipped marines or room for 4,536 kg of cargo with stowed seats. A power-operated ramp in the rear has a single-vision block and a door in its left side. There are three troop hatches on the roof.

The vehicle has no NBC system. There are night-driving lights. The LVTP7 has a number of kits, including an ambulance for six stretchers, navigation kit, and a winterization kit for outside temperatures down to -54 degrees centigrade.

No preparation is required for fully-amphibious operation. It is propelled by two water jets in the rear. The pumps have special exhaust nozzles for maximum thrust. A hinged steering deflector reverses direction. The tracks also can provide propulsion when floating. There are two electric and two hydraulic bilge pumps.

A Detroit Diesel 8V-53T, 8-cylinder, water-cooled, turbo-charged engine develops 400 horsepower at 2,800 revolutions per minute (rpm). The engine can be removed in 45 minutes. Key specifications are provided below.

### Measurements

<u>Crew</u> , 3	<u>Track width</u> , 533mm
<u>Passengers</u> , 25	<u>Track length on ground</u> , 3.94 meters
<u>Combat Weight</u> , 22,838 kg	<u>Fuel capacity</u> , 681 liters
<u>Length</u> , 7.943 meters	<u>Range at 40 km/h</u> , 482 km
<u>Width</u> , 3.27 meters	<u>Endurance water</u> , 7 hours
<u>Overall height</u> , 3.263 meters	<u>Road speed</u> , 64 km/h
<u>Ground clearance</u> , 0.406 meters	<u>Water speed, waterjets</u> , 13.5 km/h
<u>Track</u> , 2.609 meters	<u>Water speed, tracks</u> , 7.2 km/h

### Armor

<u>Hull sides</u> , 31-45mm	<u>Rear</u> , 35mm
<u>Hull top</u> , 30mm	<u>Ramp outer</u> , 25.4mm
<u>Hull floor</u> , 30mm	<u>Ramp inner</u> , 12.7mm

d. Vehicle Capabilities. The AAV7A1 can

- cross a 2.438-meter trench.
- mount a 0.914-meter vertical step.
- climb a 60-percent grade.
- climb a 40-percent side slope.
- ford amphibiously.

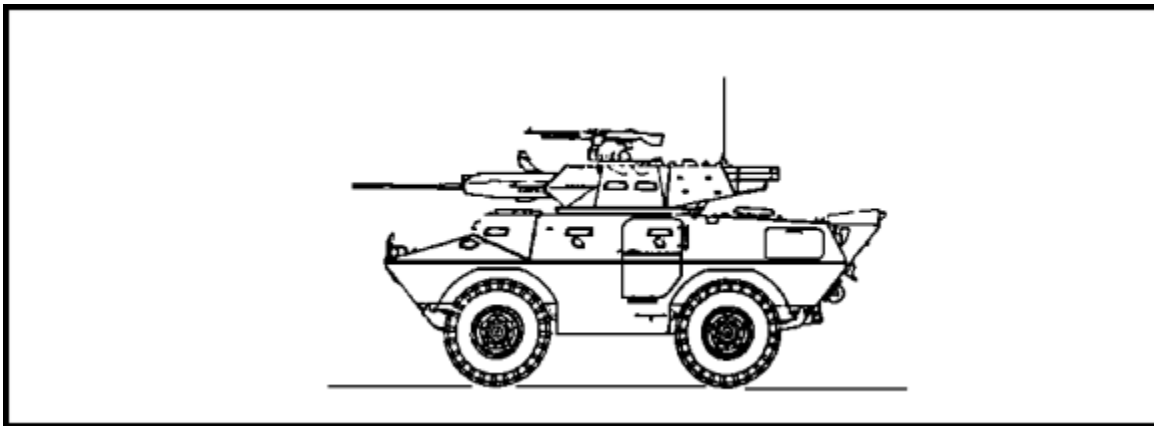
e. Armament Characteristics. Beside the engine on the right side is a turret installation. A hatch cover opens to the right. There are eight vision blocks and a sight for a 12.7-mm (.50-cal) M85 machine gun. This can fire at a high rate of 1,050 rounds per minute or a low rate of 450 rounds per minute. Of a total 1,000 rounds carried, 400 are at ready use.



f. Countries Served. The AAV7A1 or the LVTP7 is in service with the following countries:

Argentina	Brazil
Italy	Korea, South
Spain	Thailand
USA	Venezuela

3. Commando V-150 Armored Vehicle Range/APC (U.S.) (Figure 2-3). The V-150 was introduced to replace the V-100, which is still used by the U.S. Air Force at Nellis Air Force Base to simulate SA-9 SAM systems and command and control systems of the former Soviet's. The current production model is the V-150S. These vehicles have been widely exported, and are used by the U.S. Army and U.S. Air Force. As a result of experience in use, the vehicle has been constantly updated and improved. [Figure 2-3](#) is a drawing of a V-150 Commando with two-man turret armed with a 20-mm Oerlikon cannon, a 7.62-mm coaxial machine gun, and a 7.62-mm anti-aircraft machine gun.



**Figure 2-3. V-150 Commando.**

a. Variants. There are a number of variants of the V-150 Commando. They are discussed below.

(1) Commando with MG Turret. This a basic vehicle fitted with a Cadillac Gage one-man turret which mounts twin 7.62-mm machine guns or a combination of 7.62-mm/.50-cal machine guns. The weapons are controlled mechanically with a hand-operated gearbox for 360-degrees of traverse. When fitted with twin 7.62-mm machine guns, 3,800 rounds of ammunition are carried, 800 of which are in the turret for ready use, and 3,000 in the hull. A powerful spotlight is mounted coaxially with the weapons. The turret has a hatch cover opening to the rear, eight vision blocks, and an M28C sight. This model has a crew of three and can carry seven infantrymen. Height to the top of the turret is 2.54 meters.

(2) Commando with 1m MG Turret. This is the basic vehicle fitted with the Cadillac Gage 1m turret. This turret can be fitted with twin 7.62-mm or twin .50-cal machine guns or a combination. Depending on the armament installed, 1,400 rounds of .50 caliber ammunition are carried, of which 400 are for ready use in the turret, or 3,800

rounds of 7.62-mm ammunition, of which 800 are for ready use in the turret. There is a single hatch cover opening to the rear, eight vision blocks, an M28C sight, and a coaxially-mounted spotlight. This model has a crew of three and can carry seven infantrymen. Height to the top of the turret is 2.59 meters.

(3) Commando with 1m 20-mm Turret. This model is a basic vehicle with a one-man turret which mounts a 20-mm Oerlikon 204 GK cannon with provision for coaxial 7.62-mm machine gun. The vehicle carries 400 rounds of 20-mm ammunition, 200 in the turret and 200 in the hull. There is also 3,200 rounds of 7.62-mm ammunition, 220 for ready use and the remainder in the hull. The turret has 360-degree traverse by electro-hydraulics or manual backup. There are eight vision blocks, a telescopic sight, a searchlight, and a blower for removing turret fumes. This vehicle has a three-man crew of commander, driver, and gunner, and can carry five infantrymen. It has a height of 2.895 meters.

(4) Commando with 20-mm Turret. This version is a basic vehicle with a two-man turret fitted with the 20-mm cannon, a 7.62-mm coaxially mounted machine gun, and a 7.62-mm anti-aircraft machine gun. The cannon has a rate controller for firing 1, 2, or 4 rounds per second, or fully automatic. The vehicle carries 400 rounds of 20-mm ammunition, 200 of which are for ready use. There are also 3,200 rounds of 7.62-mm ammunition, with 400 in the turret for ready use. There are two vision blocks on each side of the turret. There is a telescopic gunner's sight and a commander's periscope that moves through 360 degrees. The turret also has an external anti-aircraft sight, a spotlight, and turret blower. This vehicle has a crew of three and can carry two infantrymen. Height to the top of the turret is 2.54 meters.

(5) Commando with 25-mm Turret. This vehicle is the V150S model with a turret armed with a 25-mm M22 McDonnell Douglas Helicopters Chain Gun, a coaxial 7.62-mm M240 machine gun, and another 7.62-mm machine gun on the turret roof. The turret holds 230 rounds of 25-mm ammunition (170 HE and 60 armor piercing (AP)), and there are another 400 rounds in the vehicle. There are 400 rounds of 7.62-mm ammunition in the turret, 200 at the anti-aircraft station on the roof, and 1,000 in the vehicle.

(6) Commando with 40-mm/12.7-mm Turret. A one-man turret is armed with a 40-mm Mk 19 Mod 1 grenade launcher on the left and a 12.7-mm M2 HB machine gun on the right. On either side at the rear of the turret are four smoke dischargers.

(7) Commando V-150 S. The V-150 S is 46 cm longer than the V-150. It has more internal space and an increased payload of 726 kg, for a total payload of 3,357 kg. The wheelbase is lengthened and the suspension strengthened. A new transfer case gives better grade-climbing performance. There is a new hydraulic boost brake system and an improved cooling system. In 1981 the V-150 S was fitted with two-man turrets having either a 90-mm Cockerill Mk III gun or a 25-mm M242 McDonnell Douglas Helicopters Chain Gun.

(8) Commando Air Defense Vehicle. This is the basic vehicle equipped with the same turret as is mounted on the M167 towed system and armed with a 20-mm six-barrelled General Electric cannon with an optical sight. For a more stable platform, three outriggers are lowered to the ground: one at the front and one on each side of the hull towards the rear. This vehicle was developed for the Saudi Arabian National Guard.

(9) Commando with 76-mm Turret-mounted Gun. This model is equipped with a two-man power-operated turret armed with a 76mm L22A1, with a 7.62-mm machine gun mounted coaxially to the left of the main gun, and a 7.62-mm anti-aircraft machine gun on the turret roof.

(10) Commando with 90-mm Turret-Mounted Gun. This vehicle has a 90-mm main gun and a coaxially-mounted 7.62-mm machine gun. Another 7.62-mm anti-aircraft machine gun is on the turret roof. A 500,000 candlepower spotlight is mounted coaxially with the main gun. There are 39 rounds of 90-mm ammunition, of which 8 are in the turret. There are also 3,200 rounds of 7.62-mm ammunition, 400 for ready use in the turret, 200 for the anti-aircraft gun, and the remainder in the vehicle. There are two vision blocks in the left and one in the right side of the turret. A commander's periscope can turn through 360 degrees.

(11) Commando with 81-mm Mortar. A 81-mm M29 turntable-mounted mortar fires through the roof of this Commando. Concertina doors open at either side of the roof. A 7.62-mm machine gun can be mounted at any one of four positions around the top of the hull. The vehicle carries 62 mortar bombs and 2,000 rounds of 7.62-mm ammunition. The mortar can be removed from the vehicle and fired from the ground. The vehicle has a crew of five.

(12) Commando with TOW Antitank Guided Weapon (ATGW) System. Similar to the above mortar model, this Commando is armed with a Hughes TOW ATGW system and seven TOW missiles. Hatches on the top open to the front and rear. A 7.62-mm machine gun can be mounted at any one of four positions around the top of the hull. The vehicle carries 2,000 rounds of 7.62-mm ammunition. There is a crew of four, and the vehicle can also carry two infantrymen.

(13) Commando Command Vehicle. This is a standard vehicle equipped with a fixed armored pod on the roof. There are firing ports in each of the four sides of the pod. Behind a 7.62-mm pintle-mounted machine gun is a hatch cover opening to the rear. There are 2,000 rounds of 7.62-mm ammunition, 200 for ready use. Inside is a mapboard, table, and communications equipment. The command vehicle has a crew of three and carries seven staff members.

(14) Base Security Vehicle. Developed for the U.S. Air Force, this model has a crew of three and carries eight fully-equipped infantrymen. Like the mortar model, it has concertina doors opening to either side. Provision is made for mounting 7.62-mm machine guns or 40-mm grenade launchers in four positions in the front, sides, and rear. The vehicle can carry a total of 3,000 rounds of 7.62 ammunition.

(15) Malaysian Upgraded V-150 Commando. This model is an upgraded 90-mm V-150 version. The original gas engine and manual transmission were replaced by a more fuel-efficient diesel and fully-automatic transmission.

(16) Police Emergency Rescue Vehicle (ERV). This model has a three-man crew and carries nine people. A number of police authorities use it. Many were bought by Turkey. It has a fixed pod with six vision blocks and eight vertical gun ports. In front of a rear-opening hatch cover on the roof is a 7.62-mm or a 12.7-mm machine gun.

(17) Recovery Vehicle. The Commando recovery vehicle has a heavy-duty 11,340-kg winch. When two stabilizers are lowered at the front, a boom that pivots forward has a capacity of 4,536 kg. The recovery vehicle is armed with either a 7.62-mm or a 12.7-mm machine gun with 2,200 rounds of ammunition.

b. Recognition Features. The Commando V-150 has the following features:

- Two tires on each side.
- The lower hull slopes upward at front, sides and rear.
- The driver has two vision blocks in front and one to his left.
- The commander on the right has one vision block in front and one on his right.
- The commander and driver each have a hatch cover opening to the outside.
- A cupola in the center of the troop compartment can be traversed through 360 degrees and has a hatch cover opening to the rear.
- There is a door on each side of the hull just forward of the rear wheel. The lower part folds downwards. The upper part, which has a vision block and firing port, opens to the rear.
- In front of each side door is another vision block and firing port.
- In the rear is another door on the right side. The lower part opens downwards and the upper part, containing a vision block and firing port, folds upwards.
- The Commando appears much like the American Dragoon series and the Portuguese Chaimite.

c. Vehicle Characteristics. On the left side in the rear is the engine compartment. This has access panels on the side and top of the hull. The vehicle can operate in temperatures of 130 degrees Fahrenheit. A fire-extinguishing system is operated by the driver.

Standard military automotive components are used whenever possible in the V-150 Commando. Original vehicles have Chrysler 361 V-8 gas engines that develop 200 horsepower at 4,000 rpm. A manual transmission has one reverse and five forward speeds. New vehicles have an automatic transmission and a V-8 diesel that develops 202 horsepower at 3,300 rpm.

Run-flat tires have self-cleaning treads. The wheels propel the fully-amphibious Commando through the water. There is an internally-mounted winch on the front of the hull with a 4,536-kg capacity. The all-welded hull protects against small-arms fire, overhead blast, shell splinters, and Molotov cocktails.

Standard equipment includes fuel and water cans, two hand-held fire extinguishers, pioneer tool set, tow cable, breaker bar and lug wrench, first aid kit, vehicle tool kit, pamphlet bag, oddment box, slave cable, spare vision blocks, and an air compressor with hose.

Optional equipment for the Commando includes:

- Smoke or smoke/fragmentation launchers.
- Fixed pintle socket for rear.
- Rear ring mount with 7.62-mm pintle and cradle.
- Ring mount and cradle for .50-cal machine gun or 40-mm automatic grenade launcher.
- Gun shield for fixed pintle socket or ring mount weapon.
- Spotlight for fixed pintle socket or ring mount weapon with or without shield.
- Night vision equipment.
- Periscope for ring mount (standard on 20-mm, 76-mm and 90-mm turret ring mounts).
- Spare periscope and stowage.
- Weapons (where applicable).
- Extra spare barrel stowage.
- Hand-held weapon stowage.
- M26 hand grenade stowage.
- Smoke hand grenade stowage.
- Binocular stowage.
- Radios and associated mountings.
- Canopy with poles (pod type vehicles only).
- Vision blocks in pod (standard on Police ERV).
- Gun ports in pod (standard on Police ERV).
- Sight M28C x 5.6 power (machine gun turret vehicles only).
- Land navigation system and/or vehicle heading reference system.
- NBC system.
- Public address system (standard on Police ERV).
- Heater kit.
- Air-conditioning system.
- Wiper kit for driver.
- Blackout covers.
- Handbrake warning light.
- Cooler kit.
- Lifter boom.

### Measurements

<u>Crew</u> , 3	<u>Height</u> , 2.54 meters
<u>Passengers</u> , 2	<u>Road speed</u> , 88 km/h
<u>Configuration</u> , 4 x 4	<u>Water speed</u> , 5 km/h
<u>Combat weight</u> , 9,888 kg	<u>Fuel capacity</u> , 303 liters
<u>Length</u> , 5.689 meters	<u>Range</u> , 643 km
<u>Width</u> , 2.26 meters	

d. Vehicle Capabilities. The Commando V-150 can

- mount a 0.609-meter vertical step.
- climb a 60-percent grade.
- climb a 30-percent side slope.
- ford amphibiously.

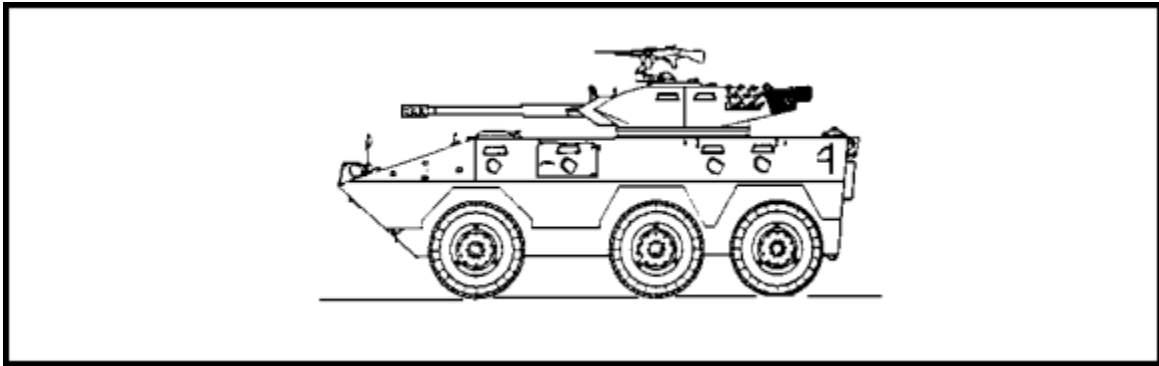
e. Armament Characteristics. The basic Commando V-150 has a turret-mounted 20-mm cannon and 400 rounds of main-gun ammunition. Some 3,200 rounds of 7.62-mm ammunition are carried for machine guns. Smoke-laying equipment is optional. The electro-hydraulic/manual turret power is controlled by the commander or gunner.

f. Countries Served. The Commando V-150 is used in the following countries:

Bolivia	Indonesia	Sudan
Botswana	Jamaica	Taiwan
Cameroon	Kuwait	Thailand
Chad	Malaysia	Tunisia
Dominican	Panama	Turkey
Republic	Philippines	USA
Gabon	Saudi Arabia	Venezuela
Guatemala	Singapore	Vietnam
Haiti	Somalia	

#### 4. Commando V-300 Armored Vehicle Range (U.S.) (Figure 2-4).

This six-by-six configuration of armored vehicles was developed out of the successful four-by-four Commando V-150 described above. [Figure 2-4](#) shows the Cadillac Gage V-300 Commando with a two-man turret armed with a 90-mm Cockerill Mark III gun.



**Figure 2-4. V-300 Commando.**

a. Variants.

(1) TOW Anti-tank. With 10 reserve missiles carried in the hull, two missiles are at the ready-to-launch position on the same mount as used in the M901 Improved TOW Vehicle based on the M113 chassis. The vehicle also has a 7.62-mm machine gun and 2,000 rounds of ammunition.

(2) 81-mm Mortar. This vehicle is equipped with a turntable-mounted 81-mm mortar has a range of 150 to 4,400 meters. The vehicle can carry 60 mortar bombs. It also has a 7.62-mm machine gun and 2,000 rounds of ammunition.

(3) Ambulance. This version is unarmed and has a raised roof. A ramp in place of twin doors at the rear facilitates loading stretchers and walking wounded.

(4) Others. Other models include a cargo carrier, command vehicle (with higher roof line), recovery vehicle, and anti-aircraft with missile system such as ADATS, or a gun system such as the General Electric 20-mm Vulcan as installed in a number of Saudi Arabian V-150 Commando 4 x 4 vehicles.

b. Recognition Features. The hull of the Commando V-300 has a shape similar to the V-150. Some distinguishing features of the V-300 are:

- Three rubber tires on each side.
- The turret is centered over the middle wheel.
- The rear of the hull is flat, with two doors for infantry access.
- In the left front of the hull, the driver has a square hatch cover opening to the rear. In front are three periscopes. To the left of the driver in the side of the hull is a bullet-proof vision block with a firing port underneath. To the rear of this is a small rear-opening half door with vision block and firing port.
- The engine compartment in the front right has air inlets and outlets on the roof and an exhaust pipe in the right side of the hull.
- On the glacis plate are receptacles for a shovel and pick axe. Under the nose is an internal hydraulic 9,072-kg winch.

c. Vehicle Characteristics. Front and rear axles have positive No-Spin differentials for maintaining traction in off-road conditions. All wheels have hydraulic brakes and run-flat tubeless tires with a self-cleaning tread design.

The all-welded unitized hull is made of special high-hardness steel ballistic plate that protects the crew from small-arms fire and shell splinters. Optional equipment includes night-vision devices, heater kit, air-conditioning system, NBC system, wiper kit for the driver, and a slave cable.

The troop compartment in the rear on each side has three bulletproof vision blocks and firing ports. Two doors in the rear each have vision blocks and firing ports. Instead of the two-part hatch cover there may be a circular hatch cover with pintle-mounted 7.62-mm machine gun.

#### **Measurements**

<u>Crew</u> , 3	<u>Height</u> , 2.69 meters
<u>Passengers</u> , 9	<u>Road speed</u> , 95 km/h
<u>Configuration</u> , 6 x 6	<u>Water speed</u> , 5 km/h
<u>Combat weight</u> , 19,323 kg	<u>Fuel capacity</u> , 265 liters
<u>Length</u> , 6.4 meters	<u>Range</u> , 700 km
<u>Width</u> , 2.54 meters	

d. Vehicle Capabilities. The Commando V-300 can

- mount a 0.609-meter vertical step.
- climb a 60-percent grade.
- climb a 30-percent side slope.
- ford amphibiously.

e. Armament Characteristics. The V-300 Commando supports a number of armament installations. They include the combinations discussed in the following subparagraphs.

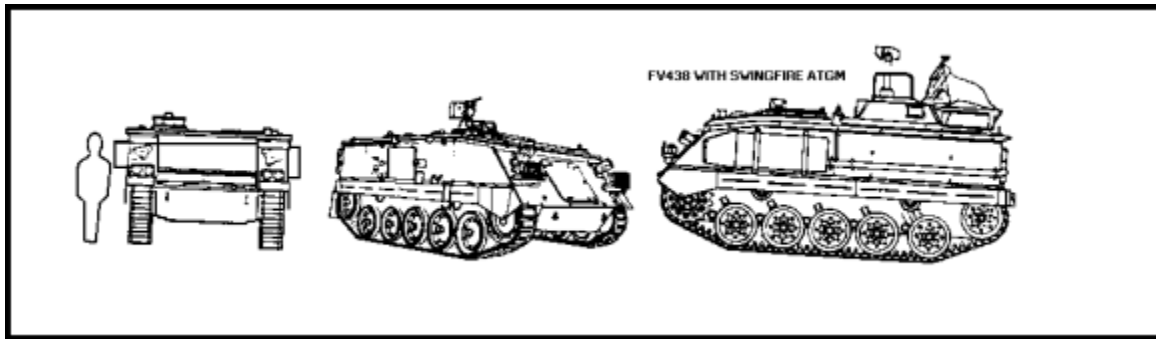
- (1) Cadillac Gage two-man turret with 90-mm Cockerill Mk III gun.
- (2) Cadillac Gage two-man turret with 76-mm Royal Ordnance L23A1 gun.
- (3) Turret armed with 25-mm M242 McDonnell Douglas Helicopters Chain gun, 7.62-mm coaxial and 7.62-mm anti-aircraft machine guns, and smoke dischargers.
- (4) Cadillac Gage two-man turret with 20-mm Oerlikon cannon.
- (5) Cadillac Gage one-man 1 meter machine gun turret and a ring mount with 7.62-mm or 12.7-mm machine gun.

f. Countries Served. Commando V-300s are in service with Kuwait and Panama.



## 5. FV432 Armored Personnel Carrier (Figure 2-5).

About 3,000 of these APCs were produced from 1963 to 1971. Newer models have the NBC pack on the right side of the hull which is almost flush against the hull rather than protruding, as on earlier vehicles. Many automotive components of the FV432 APC are used on the FV433 Abbot 105-mm self-propelled gun. Most FV432s are expected to remain in service, and many will undergo automotive improvements including a new steering and braking unit. [Figure 2-5](#) shows the FV432 APC fitted with a Peak Engineering lightweight turret armed with 7.62-mm machine gun.



**Figure 2-5. FV432 Armored Personnel Carrier.**

### a. Variants.

- (1) Ambulance. The unarmed ambulance carries four stretcher patients or two stretcher and five seated patients. The stretchers are easily loaded with sliding swivel racks.
- (2) Carl Gustaf. A Swedish 84-mm Carl Gustaf anti-tank weapon may be mounted with a bar across the top of the troop compartment. The standard armored personnel carrier (APC) may also carry a Euromissile MILAN ATGW which is deployed away from the vehicle.
- (3) Command. The seven-crew command model has two mapboards and extra communications equipment. More room can be made by erecting a penthouse measuring 3.6 x 2.74 x 1.98 meters.
- (4) 81-mm Mortar Carrier. This is the basic vehicle equipped with an 81-mm L16 mortar on a turntable which is mounted in the rear of the hull, and can be traversed through 360 degrees. The mortar has a range of 5,660 meters and 160 mortar bombs are carried. The vehicle has a crew of six.
- (5) Maintenance Carrier. Designated the FV434, this model is used mainly to change major components in the field, such as the complete powerpack of the Chieftain MBT. There is a crane on the right side of the vehicle which has a lifting capacity of 3,050 kg. The suspension of the FV434 can be locked when the crane is being used. The vehicle has a crew of four.
- (6) Minelayer. The FV432 is used by the Royal Engineers to tow the Bar minelayer which can lay mines at a rate of 600 per hour. A THORN EMI ranger anti-personnel

minelaying system can be mounted on the top of the FV432 to enable a combined anti-tank and anti-personnel minefield to be laid.

(7) Radar. A large scoop-shaped antenna protrudes from the FV432 when mounted with a mortar-locating radar or a short-range radar system.

(8) Recovery. This is the basic FV432 with a winch installed in the rear troop compartment. The winch is driven from the PTO on the engine transfer case.

(9) Royal Artillery Vehicles. The FV432 is used in an artillery battery command role when fitted with the Marconi Command and Control Systems Field Artillery Computer Equipment and the Plessey sound ranging system.

(10) Royal Engineers Vehicles. In addition to using the FV432 as a minelaying vehicle as previously described, the Royal Engineers use it to tow the Giant Viper mine-clearance trailer.

(11) Royal Signals Vehicles. Designated FV439, this model has extensive antenna arrays on the roof for specialized communications.

(12) FV438 Wavell. A command and control Wavell automatic data processing system is recognizable by a large external box on the roof.

b. Recognition Features. Recognition features for the FV432 are discussed below.

- Fully tracked.
- Five road wheels.
- Similar to the M113A1.
- May or not have a small turret.
- Long, rectangular-shaped body.
- Exhaust pipe runs along the left side of the hull.
- NBC pack on left forward side of hull.

c. Vehicle Characteristics. The all-welded steel hull protects against small-arms fire and shell splinters. On the front right side is the driver's hatch cover that opens to the left. The hatch has a wide-angle periscope. Behind the driver is the commander's cupola that can be traversed through 360 degrees. The cupola's hatch cover has three periscopes. A 7.62-mm machine gun is directed out the front of the cupola.

A few FV432s issued to the Berlin Brigade were armed with the same 30-mm RARDEN cannon as mounted on the turret of the Fox armored car. Many are fitted with a lightweight turret with 7.62-mm machine gun. This turret has a rear-opening hatch cover, three periscopes, and four smoke dischargers on either side. The turret is over the front part of a circular troop compartment hatch that replaces the original four-part hatch.

Air inlet and outlet louvers are on the roof above the engine compartment on the left front. A forward-opening hatch on the glacis plate provides access to the steering system.

The rear troop compartment seats 10 infantrymen on two benches running down the sides. These fold up for a cargo capacity of 3,670 kg. There is a large door in the rear of the troop compartment with a vision block. In the roof are large circular hatch covers that open to both sides and fold in the middle.

An NBC system on the right side of the hull gives fresh air for the troops. Unlike the similar M113 APC, the FV432 is not amphibious without preparation. The FV432 must be prepared with a flotation screen erected with ten stays around the top of the hull. A trim vane goes up in front, and an extension goes on the exhaust pipe. When floating, it is propelled by its tracks. Most of these vehicles have had their amphibious capability removed.

The torsion-bar suspension has five dual rubber-tired road wheels, two track-return rollers, and a drive sprocket in front. Friction shock absorbers are on the first and last wheels. Rubber-bushed steel tracks have removable rubber pads.

### Measurements

<u>Crew</u> , 2	<u>Track</u> , 2.184 meters
<u>Passengers</u> , 10	<u>Track width</u> , 343 mm
<u>Weight</u> , 15,280 kg	<u>Track length on ground</u> , 2.819 meters
<u>Length</u> , 5.251 meters	<u>Armor</u> , 6-12 mm
<u>Width</u> , 2.8 meters	<u>Speed</u> , 52.2 km/h
<u>Height</u> , 2.862 meters	<u>Fuel capacity</u> , 454 liters
<u>Ground clearance</u> , 0.406 meters	<u>Range</u> , diesel, 480 km gas, 424 km

d. Vehicle Capabilities. The FV 432 armored personnel carrier can

- cross a 2.05-meter trench.
- mount a 0.609-meter vertical step.
- climb a 60-percent grade.
- ford 1.066 meters without preparation.
- ford amphibiously with preparation.

e. Armament Characteristics. The armament depends upon the roles for which the vehicles are used. There is a 7.62-mm general purpose machine gun (GPMG) mounted on the forward part of the commander's cupola. Vehicles used in the command role and other rear roles normally have a 7.62-mm Bren light machine gun (LMG). When equipped with the GPMG, the vehicle carries 1,600 rounds of belted 7.62-mm ammunition. When carrying the Bren LMG, the vehicle has 1,400 rounds of 7.62-mm ammunition (50 magazines, each holding 28 rounds).

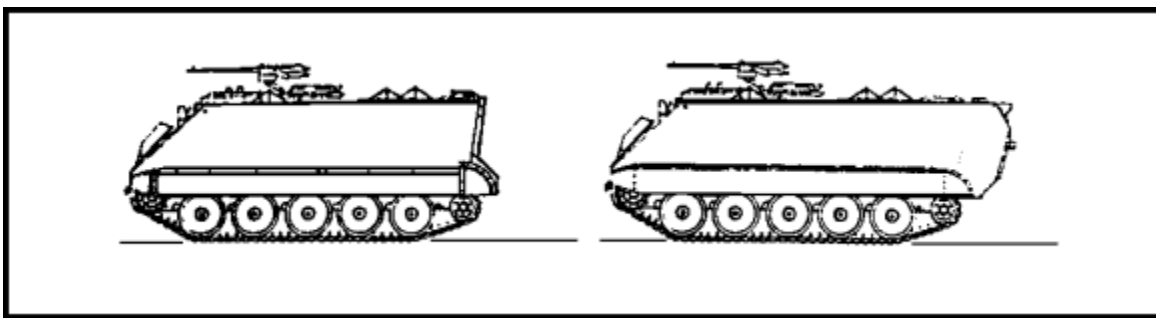
f. Countries Served. Users are India and the United Kingdom.

## 6. M113A1 and M113A2 Armored Personnel Carrier.

The M113 family was designed to be an air-transportable, armored, multi-purpose vehicle family, and would provide a lightweight, armored personnel carrier for armor and infantry units. It is capable of amphibious and air-drop operations, has superior cross-country mobility, and adapts to multiple functions by the application of kits or modifications. After 10 pre-production vehicles were built, the M113A1 replaced the M113 in production.

The M113A2 is an upgraded M113A1 with no external differences. It is mainly employed in transporting troops or cargo in support of tactical operations, but may be found in ambulance, mortar, and other configurations and roles.

[Figure 2-6](#) shows the M113A1 armored personnel carrier with a 12.7-mm (.50-cal) M2 HB machine gun. On the right is the M113A3 APC with fuel tanks at the rear.



**Figure 2-6. M113A1 and M113A3 Armored Personnel Carriers.**

a. Variants. The M113 APC may be found in ambulance, mortar, and numerous other weapon configurations.

(1) M113A2 (formerly Product Improved M113A1). The M113A2 has an improved engine cooling design and improved suspension. A rear-mounted, armored fuel cell is currently available. This option provides more interior space and reduces the danger of fire.

(2) M113A3. This version has the cooling and suspension improvements of the M113A2, as well as better performance and reliability. The 6V-53 (212 hp) diesel engine is replaced by the turbo-charged Detroit Diesel 6V-53T (275 hp). There is a new X200-4 Allison transmission with four forward speeds instead of three.

Hydrostatic steering provides smoother turning with less effort and reduced shock loading on the suspension system as well as greater power efficiency for more horsepower and fuel savings. Driver sticks were replaced by a steering wheel and brake pedal.

The M113A3 has a different generating system, four batteries, and improved electrical diagnostic capabilities. Also it has armored external fuel tanks and internal spall protection liners.

(3) M113/M113A1/M113A2 with Dozer Kit. A kit can adapt the APC for general bulldozing, improvement of water entrances, and grading. It does not change the basic load-carrying ability.

During amphibious operations, the front-mounted buoyant blade acts as a trim vane after removal of the standard trim vane.

(4) M106/M106A1/M106A2 107-mm Mortar Carrier. Designated the Carrier, Mortar, 107-mm, Self-propelled, this is the basic APC with an opening in the roof covered by a three-part hatch. Firing through the opening is a 4.2-inch (107-mm) M30 mortar on a turntable at the rear. Mounted externally on the left side of the hull is a mortar baseplate and bridge for use away from the vehicle if necessary. The vehicle carries 88 to 93 mortar rounds. The carrier has the 12.7-mm (.50-cal) M2 HB machine gun. An Israeli Soltam 120-mm mortar system is expected to replace the 107-mm mortar.

(5) M125/M125A1/M125A2 81-mm Mortar Carrier. Designated Carrier, Mortar, 81-mm, Self-propelled, this vehicle has an 81-mm M29 mortar on a turntable firing through a three-part hatch. The mortar can be used away from the vehicle. It carries 114 mortar bombs. It has the 12.7-mm (.50-cal) M2 HB machine gun.

(6) M163 Vulcan Self-Propelled Anti-aircraft Gun. This is an M113A1 chassis fitted with a one-man electrically-driven turret which is armed with a 20-mm M168 Vulcan gun, Navy Mk20 Mod A gyro lead-computing sight, and a range-only radar.

(7) M548 Cargo Carrier. This unarmored cargo carrier uses many automotive components of the M113A1 APC. It has a payload of 7,258 kg. New vehicles have the suspension and cooling system improvements. A modified M548 has an anti-tank minelaying system for the German Army. The M548 chassis also is used for a Lance surface-to-surface tactical nuclear missile system and tactical electronic reconnaissance and countermeasures systems.

(8) Tracked Rapier. A rebuilt M548 tracked cargo carrier supports the Tracked Rapier SAM system in service with the British Army. At the front is a fully-enclosed armored compartment. On the roof is the Rapier optical tracker, which is retracted for traveling. At the rear is a turntable with eight Rapier SAMs at the ready-launch position. The Forward Area Support Team (FAST) vehicle carries spare parts. The Tracked Rapier Support Vehicle (TRSV) carries 20 Rapier SAMs.

(9) M730 Chaparral SAM launcher. This version is based on a modified M548 cargo carrier has a rear-area flat bed. A pedestal-mounted, one-man power-operated turret with four Chaparral SAMs at the ready-to-launch position is mounted over the rear area. Another eight missiles are carried in reserve. It is used by the U.S. Army, Egypt, Israel, Morocco, Portugal, Taiwan, and Tunisia.

(10) M577/M577A1/M577A2 Command Post. This vehicle's full designation is the Carrier, Command Post, Light Tracked, M577 or M577A1. They have the basic chassis with a higher roof to the rear of the driver's position. A tent can be erected to the rear of

the hull to provide increased work area when in a static role. Mounted externally is a generator to power additional communications equipment. The Command Post vehicle can also be used as a fire direction center, communications vehicle, or a mobile medical treatment facility.

(11) Stretched M577A2 Command Post. This has six, rather than five, road wheels on each side. It has additional external fuel tanks and the complete M113A3 powerpack. There is an option of additional armor on the roof and an environmental control unit. It could meet the Army's requirement for a Standard Integrated Command Post System (SICPS).

(12) M113A2 Recovery Vehicle. The Recovery Vehicle, Fully Tracked, Light Armored M113A2 is the basic chassis fitted with a hydraulic winch for recovering disabled vehicles. During recovery operations, spades are lowered to the ground from either side of the ramp. For use in soft soil, an auxiliary spade unit is carried on the roof. The winch has a capacity of 9,070 kg. An auxiliary 1,361-kg crane is on top of the hull on the left side.

(13) M113 APC with TOW. This vehicle is equipped with a pedestal-mounted TOW system that is retracted into the troop compartment when not in use. The vehicle is designated XM233E1 TOW Missile Carrier.

(14) M901/M901A1 Improved Tow Vehicle. This version is essentially an M113A2 APC fitted with the ground TOW launching system. The system consists of an M27 cupola equipped with an image transfer assembly, an armored launcher, missile guidance set, and an auxiliary battery pack. The launcher assembly contains two TOW launch tubes, TOW sight assembly, and an acquisition sight mounted on top of two elevating arms. In addition to the 2 ready-to-launch missiles, another 10 are carried in the hull. A 7.62-mm machine gun is mounted on the cupola for local defense, and 1,000 rounds of ammunition are carried.

(15) M981 Fire Support Team Vehicle (FISTV). This vehicle is the M901 Improved TOW Vehicle equipped with the AN/TVQ-2 GLLD with north-finding module and line-of-sight subsystem, AN/TAS-4 night sight, land navigation system, and extensive communications equipment. In 1988, Egypt received 20 Artillery Target Locating Vehicles (ATLV) which are very similar to the U.S. Army's FISTV.

(16) M1059 Smoke Generating System. This vehicle is an M113A2 with two M54 smoke generators mounted on top of the hull. The smoke generators can be used either singly or in tandem.

(17) M113 with Composite Armor. The hull is made of a reinforced plastic material covered with ceramic tiles with a total thickness of about 32mm. This reportedly provides greater protection than aluminum armor plate at equal or lighter weight, which is critical in amphibious vehicles.

(18) Thyssen Henschel Applique Armor. A 650-kg armor kit for the APC provides protection against 14.5-mm projectiles at a range of 100 meters, and 20-mm projectiles at a range of 200 meters.

(19) Creusot-Loire Add-on Armor. An add-on armor package developed by Creusot-Loire Industrie can be installed or removed with on-board tools. Some panels are fixed and others are removable for maintenance access. This package does not change the vehicle's basic amphibious characteristics. There are three kits:

- A 445-kg kit giving complete protection against penetration from 14.5-mm armor piercing rounds at a range of 300 meters.
- A 830-kg kit providing protection against 12.7mm armor-piercing rounds at a range of 100 meters, and 20-mm and 23-mm armor-piercing rounds at a range of 200 meters.
- A kit still under development for protection against former Soviet RPG-7 anti-tank weapons.

(20) GIAT Armor Package. The M113 vehicles can be fitted with an add-on armor package by GIAT of France. It protects against 14.5-mm former Soviet heavy machine gun and 20 to 23-mm AP attack. Modular panels of special hard steel are attached to the front, sides, and rear. A basic kit weighs 650 kg. A version with a false floor weighs 950 kg. The kit increases the width of the M113 and slightly reduces the power-to-weight ratio. Top speed is not affected.

(21) M113 with Bofors RBS 70 SAM. This variant is a kit which enables a standard M113 series APC to be equipped with a Bofors surface-to-air (SAM) system on a pedestal in the rear troop compartment.

(22) M113 with Air Defense Antitank System (ADATS). The Swiss Oerlikon-Bührle ADATS was selected by the Canadian Armed Forces for installation on 36 modified M113 APCs. On top is a turret with eight ADATS missiles, four either side, ready to launch. Between the missiles is the electro-optical module and on the turret rear is the surveillance radar.

(23) M113 with Tadpole Sight. Martin Marietta has tested the Tadpole sight with the British Army and the U.S. Army Field Artillery School at Fort Sill. Tadpole is similar to the helicopter Mast Mounted Sight (MMS). It has a 15.24-meter telescoping mast. On top is a sight providing day, night, and limited adverse weather target information. This has a laser rangefinder/designator and a silicon vidicon TV, gimballed mirror to line-of-sight stabilization system.

(24) M113A2/TS 90 Light Tank. This vehicle consists of the M113A2 APC with the roof modified to accept for the GIAT TS 90 two-man turret with 90-mm gun.

Almost every user has developed variants of the M113/M113A1 family. These variants will be discussed in subparagraph f below, which discusses countries served.

b. Recognition Features. The M113A1 and M113A2 have the following features.

- Five evenly spaced road wheels.
- No support rollers.
- Rectangular hull.
- Centered commander's cupola.
- Driver's hatch at the left front, forward of the commander's station.
- Two engine vents on the right of the driver's hatch.
- Amphibious.

c. Vehicle Characteristics. The vehicle has an all-welded aluminum hull that protects the crew from small arms fire and shell splinters. The driver sits at the front of the hull on the left side and has a single piece hatch cover that opens to the rear. To his front and left side are four M17 periscopes. There is an M19 infrared periscope in his roof hatch. To his right are air inlet and outlet louvers for the engine. Also on the roof is an exhaust pipe outlet. An engine access door hinges forward from in front of the hull.

The commander sits to the rear of the engine compartment and has a cupola that can be traversed through a full 360 degrees. There is a 12.7-mm (.50 cal) machine gun pintle-mounted on the forward part of the commander's cupola. Behind the commander's cupola is a rear-opening oblong hatch cover with a domed ventilator.

The infantrymen enter and leave through a power-operated ramp in the rear that opens downwards and has a door in the left side. There are seats for the infantrymen along each side of the hull. The seats can be folded up to allow the vehicle to be used as an ambulance or to carry cargo.

A rubber track shroud controls the flow of water over the tracks when afloat. The M113 is fully amphibious. It is propelled through the water by its tracks. Steering is the same as on land. There are two bilge pumps and a large panel trim vane which folds back on the glacis plate when not in use.

Kits available for the M113 family include:

- Anti-mine armor bolted on front half of vehicle bottom (includes buoyancy aids).
- Anchor kit (set of two for use with capstans for self-recovery).
- Buoyant side pods.
- Combination bulldozer/snow plow.
- NBC detector and automatic alarm.
- Full-width buoyant trim vane.
- Gun shields.
- Heater for personnel and cargo areas.
- Heater for engine coolant and battery.
- Stretcher kit which provides support for four stretchers when the vehicle is being used as an ambulance.



- M8A3 gas-particulate unit (includes M2A2 air purifier with flexible hoses to fit M14A1 tank gas masks of driver and commander and up to two others).
- Non-skid ramp plate kit.
- Windscreen for driving with the hatch open.

A GMC Detroit Diesel model 6V-53 six-cylinder, water-cooled, diesel engine develops 215 horsepower at 2,800 rpm. A GMC Allison TX-100-1 transmission has one reverse and three forward ranges (four on the M113A3). There is torsion-bar suspension, a rear drive sprocket and five dual rubber-tired road wheels. There are no track return rollers. The first and last wheels have hydraulic shock absorbers.

### Measurements

Crew, 2

Passengers, 11 (7 for M113A3)

Weight, M113A1, 11,156 kg

Weight, M113A2, 11,341 kg

Weight, M113A3, 12,062 kg

Length, 4.86 meters

Width, 2.68 meters

Height, 2.5 meters

Ground clearance, .043 meters (.041 meters for M113A1)

Track, 2.159 meters

Track width, 381 mm

Track length on ground, 2.667 meters

Road speed, 64-65 km/h

Water speed, 5.8 km/h

Fuel capacity, 360 liters

Range, 483 km

Armor, 12-44 mm

d. Vehicle Capabilities. The M113A1 series vehicle can

- cross a 1.68-meter trench.
- mount a 0.81-meter vertical step.
- climb a 60-percent grade.
- ford amphibiously.

e. Armament Characteristics. The main armament usually is a 12.7-mm (.50 cal) machine gun. Various other weapons are found on the different configurations of the vehicle.

f. Countries Served. Practically every user of the M113 family of APCs has developed variants. These variants are discussed below.

(1) Australia. The Australian Army has the M113A1 with the turret of the British Scorpion CVR (T) vehicle armed with a 76-mm gun. This model is amphibious with additional buoyancy aids on the sides and front. They also have 18 models fitted with the turret from the Saladin (6 x 6) armored car. Another light reconnaissance vehicle has the American Cadillac Gage turret T50 armed with a 7.62-mm and a 12.7-mm machine gun. The Australian Army is expected to extend the life of its M113A1s with upgrades. The Australian Army also uses the following:

- M113A1 APC/LRV (armored personnel carrier/light reconnaissance vehicle).
- M113A1 APC(A) (ambulance).
- M113A1 FSV (Scorpion) (fire support vehicle Scorpion turret). This is now called the Medium Reconnaissance Vehicle.
- M113A1 FSV (Saladin) (fire support vehicle Saladin turret).
- M577A1 ACV (armored command vehicle).
- M125A1 APC(M) (carrier mortar).
- M806A1 (armored recovery vehicle, light).
- M113A1 APC(F) (carrier, repair fitters).
- M548 TLC (tracked load carrier).

(2) Belgium. Belgium Mechanical Fabrications has built 525 M113 series vehicles under license for the Belgian Army. These vehicles are in a number of different variants.

(3) Brazil. The Brazilian Army has about 600 M113 series vehicles. They have their original gasoline engines replaced with a Brazilian-built Mercedes-Benz diesel.

(4) Canada. Canada has about 900 M113A1 series vehicles, including the basic APC, the M577A1 command post vehicle, the M113A1 engineer vehicle with a hydraulically-operated dozer blade in front, the M548 tracked cargo carrier, and the Lynx command and reconnaissance vehicle. Canada recently took delivery of 36 Oerlikon-Buhrle ADATS systems on a modified APC, as well as 64 TOW Under Armor (TUA) vehicles, plus ordered another 64 TUAs. The TUA is a Norwegian Kvaerner-Eureka Armored Launching Turret made in Canada under license by Invar Manufacturing.

(5) Denmark. Denmark recently ordered 50 M113 series vehicles fitted with a 25-mm cannon turret, in addition to its 530 basic M113 series vehicles in service.

(6) Egypt. In 1980, Egypt ordered 500 M113A2s. In 1984, the Pentagon offered to supply 354 M113A2 APCs, 19 Mortar carriers, 13 M577A2 command post vehicles, 23 M113A2 armored ambulances, 33 M548A1 ammunition carriers, 52 fitters vehicles and 43 M806E1 armored recovery vehicles. Egypt also developed an applique armor kit, and uses a locally-produced Soviet 120-mm mortar. A modified M113A2 chassis has a one-man power-operated turret with twin 23-mm cannons manufactured in Egypt. It has an Officine Galileo fire control system and an Electronique Serge Dassault surveillance radar. It also has the locally-built Sakr Eye SAM which is an improved version of the Soviet SA-7 Grail.

(7) Germany. One of the largest users of the M113 is Germany, who developed a number of versions. This includes radar vehicles fitted with the RATAc battlefield artillery radar and the Green Archer mortar-locating radar, an artillery observation post vehicle, 120-mm mortar carrier, and modifications to the basic APC. Most have eight smoke dischargers on the front of the hull, and are armed with a single 7.62-mm MG3 machine gun.

Conversion kits for the M113 series offered by Thyssen Henschel are:

KrKw	M113A1G	armored ambulance
PzM	M113A1G	self-propelled mortar (120-mm)
ABRA	M113A1G	artillery observation vehicle (with RATAAC)
FlgtPz	M113A1G	armored air control vehicle
Beob PzArt	M113A1G	armored artillery provision vehicle
RkPzArt	M113A1G	artillery aiming circle vehicle
GepGefStdFzg	M113A1G	command cell
GepGefStdFzg	M577A1G	command post facility variant
GepGefStdFzg	M577A1G	information cell
GepGefStdFzg	M577A1G	air support cell

Thyssen Henschel also offers: low wear track, M113A2 suspension, cooling, rear external fuel tanks, hydrostatic steering system, more powerful diesel engine, supplementary armor, NBC protection and, various turret systems.

Artillery batteries have an integrated fire control system called the Integrierte Feuerleitmittel für Artillerie Batterie (IFAB) developed by Thyssen Henschel. This has three main components: forward observer vehicle on M113A1 chassis, fire direction center vehicle on an M577A1G chassis, and data installation kits for the weapons.

Germany also use an artillery observation vehicle called the Beobachtungs-panzer Artillerie. It has a laser rangefinder and a land navigation system. There are three versions of the M577 IFAB command post vehicle: the command cell, the teleprinter cell, and the information cell.

Germany has approximately 500 mortar carriers with a Tampella 120-mm mortar in back that fires to the rear. It carries 63 mortar bombs, or only 23 when afloat.

(8) Israel. The Israelis call the M113 the Zelda. The trim vanes were removed from most vehicles. An extension was fitted to the exhaust so fumes do not blow back into the troop compartment when driving with hatches open. Up to four 7.62-mm or 12.7-mm machine guns may be mounted on top. Racks may be fitted on either side of the hull for personnel kits or other stores to give more room in the troop compartment.

The Israeli Army uses many specialized versions of the M113A1. There is an anti-tank version equipped with the Hughes TOW ATGW system, a forward ambulance, a forward engineer vehicle, modified M577 command vehicles, 60-mm Soltam mortar carriers, and technical support vehicles. A new type of armor can be fitted to the front, sides, and rear.

A RAMTA Improved TOW Vehicle has a TOW ATGW launcher that retracts hydraulically into the hull. The gunner rises on a special platform along with the complete system. The vehicle carries 10 missiles internally.

(9) Italy. Italy uses several versions of the M113. These include the M577 command post vehicles and M548 tracked cargo carriers. Italy also developed an infantry armored fighting vehicle.

There is also the SIDAM 25 (4 x 25-mm) self-propelled anti-aircraft gun system. This vehicle has a power-operated turret with a day-only fire-control system. Key modifications to the chassis are:

- Replacement of the existing engine by a more powerful Detroit Diesel 6V-53T developing 265 horsepower.
- Two new fuel tanks mounted one on either side externally at the hull rear, giving a total capacity of 360 liters.
- Modifying the top deck for an improved reverse-flow cooling system.
- Reinforcement of the idler wheel mounts and repositioning the shock absorber supports.
- The existing fan is replaced together with a new air cleaner and silencer.
- The existing transmission is modified or replaced.
- Stronger torsion bars.

The combat engineer vehicle has additional armor, a dozer blade, three-ton hydraulic crane, and a 10-ton winch with rear stabilizers.

(10) New Zealand. New Zealand has 72 M113A1 series APCs, some with the T50 turret. Some were rebuilt, and they include the M125A1 mortar carrier, M577A1 command vehicle, M579 fitters' vehicle, and the M806A1 armored recovery vehicle.

(11) Norway. The NM 135 was developed for the Norwegian Army. This has a new Swedish Haggblunds turret with a German Rheinmetall 20-mm Rh 202 cannon. Mounted coaxially to the right is a 7.62-mm machine gun. The turret is behind the engine. The commander's hatch is immediately to the rear of the driver.

(12) Pakistan. The Pakistani Army has a fleet of around 800 M113 series vehicles. Some of these have been fitted with Improved TOW and RBS 70 surface-to-air missile launchers. A new locally built air-defense version has four locally-built SA-7/HN-5 series SAMs and two 14.5-mm KPV series machine guns elevated on a pedestal.

(13) Singapore. Chartered Industries of Singapore converted the M113 to a 120-mm or 81-mm mortar carrier which is in service with the Singapore Army and is offered for export.

(14) Spain. Spain has the M113, M113A1, M113A2, M548 tracked cargo carrier, M577 command post vehicle, M113 series recovery vehicle, and the M125 81-mm mortar

carrier. They are also completely overhauled in Spain. The Spanish Army has a 120mm mortar that fires out the rear. A baseplate is carried externally on the left side of the hull.

(15) Switzerland. The Swiss Army calls the basic APC the Schutzenpanzer 63. Many have the Swedish Hagglund turret with 20-mm cannon. Other versions in service are:

- Bulldozer model (called the Geniepanzer 63).
- Command vehicle (Schutzenpanzer Kdo Spz-63).
- 120-mm mortar carrier (Minenwerferpanzer 64).
- Command vehicle (Kommandopanzer 63).
- Command vehicle with turret-mounted 20-mm cannon (Kommandopanzer 63/73).
- Repair vehicle (Kranpanzer 63).
- Wireless vehicle (Ubermittlungspanzer 63).
- Artillery command vehicle (Feuerleitpanzer 63).

(16) Vietnam. The Vietnamese Army in 1985 was observed to be still using significant numbers of American M113 series APCs, including a version similar to the ACAV but with the 12.7mm M2 HB machine gun replaced by a former Soviet 12.7-mm DShkM machine gun. The two lateral machine guns also were retained, but probably the original M60 series 7.62-mm machine guns have been replaced by former Soviet weapons of the same caliber. The Vietnamese Army in 1987 was using a flamethrower version of the M113 and ACAV models with add-on armor.

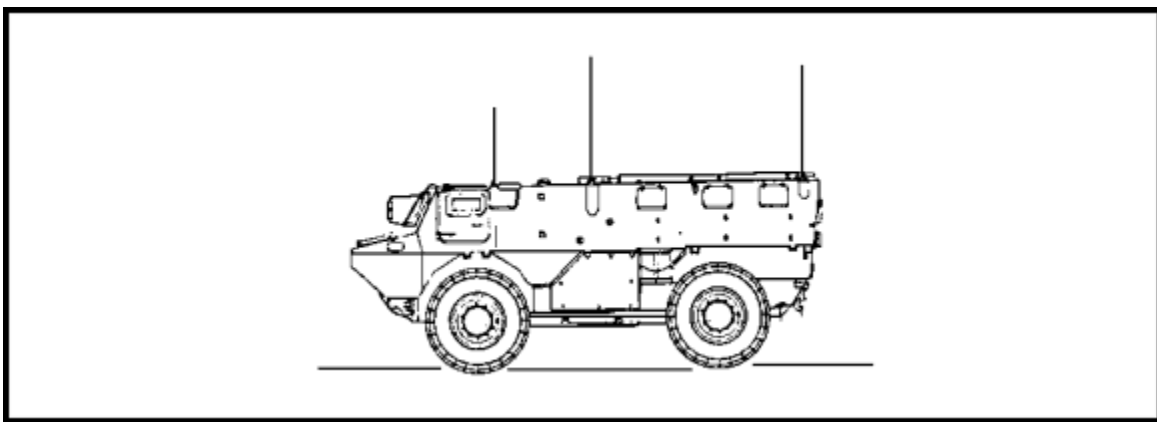
The M113 series is in service with:

Argentina	Israel	Portugal
Australia	Italy	Saudi Arabia
Belgium	Jordan	Singapore
Bolivia	Kampuchea	Somalia
Brazil	Korea, South	Spain
Canada	Kuwait	Sudan
Chile	Laos	Switzerland
Costa Rica	Lebanon	Taiwan
Denmark	Libya	Thailand
Ecuador	Morocco	Tunisia
Egypt	Netherlands	Turkey
El Salvador	New Zealand	USA
Ethiopia	Norway	Uruguay
Germany	Pakistan	Vietnam

Greece	Peru	Yemen, North
Guatemala	Philippines	Zaire
Iran		

## 7. Renault VAB Armored Personnel Carrier (France).

The Forward Area Armored Vehicle (VAB or Vehicule de l'Avant Blinde) is employed as a squad armored personnel carrier, ATGM, cargo carrier, and 120-mm mortar towing vehicle. These roles supplement the more expensive and sophisticated tracked AMX-10P for mechanized infantry units. The VAB is used in either a 4 x 4 or a 6 x 6 configuration. [Figure 2-7](#) shows the basic (4 x 4) version of the VAB as used by the French Army.



**Figure 2-7. French 4 x 4 VAB.**

a. Variants. There are a number of configurations available for the VAB. These variants are discussed below.

(1) Vehicule de Combat de l'Infanterie (VCI). The infantry combat vehicle is available in several variations, as shown at the top of next page.

(a) VAB VCI TL 20S. This vehicle has a crew of 10 to 12. It has a 20-mm cannon in a Creusot-Loire Industrie TL 20S manually-operated turret. The turret has a foldable seat and no basket in the vehicle. The vehicle carries 900 rounds of 20-mm ammunition.

(b) VAB VCI T 20. This version has a crew of 9 to 11 and is equipped with a T 20 electrically operated turret. The turret is armed with a 20-mm cannon and a coaxially mounted 7.62-mm machine gun. There are 720 rounds of 20-mm ammunition and 2,200 rounds of 7.62-mm ammunition.

(c) VAB VCI T 25. A two-man T 25 turret is electrically operated and is armed with a 25-mm cannon and a 7.62-mm coaxial machine gun. The turret has two rear-opening hatch covers. The vehicle carries 530 rounds of 20-mm and 1,200 rounds of 7.62 ammunition. There is a crew of eight.

(d) VAB VCI Dragar. This VCI has a crew of eight and is fitted with the GIAT Dragar turret which has a 25-mm cannon and a 7.62-mm coaxial machine gun. The VCI Dragar carries 620 rounds of 25-mm and 1,400 rounds of 7.62-mm ammunition.

(e) VAB VCI Toucan. A Toucan 1 turret armed with a 20-mm cannon and one 7.62-mm coaxial machine gun is fitted on this model. There is a crew of 11. It is in service with the French Air Force as a Vehicule d'Intervention sur Base (VIB).

(2) VAB Echelon (Repair Vehicle). This vehicle is equipped with welding equipment, a work bench, and tools. The three-man crew carries out vehicle repairs in the field. It has a Creusot-Loire Industrie TLI 52A turret.

(3) VCAC High-Subsonic Optically Tracked (HOT) (Anti Tank) Mephisto. The French Army has the 4 x 4 model which is the basic VAB with the Euromissile Mephisto system with four ready-to-launch HOT missiles. The vehicle also carries eight more missiles in reserve in the hull. When the launcher is retracted into the hull for travelling it is difficult to distinguish from the APC version. There is a crew of four.

(4) VCAC HOT (Anti-tank) UTM 800. This export model is in service with Qatar. Cyprus also has 18 systems. It has a Euromissile UTM 800 turret with four ready-to-launch HOT missiles. Another 16 missiles are in reserve in the hull. It has a four-man crew.

(5) VAB RATAAC and VAB ATILA. These two VABs are in French artillery regiments of armored divisions. The French Army also has reconnaissance squadrons with the VAB RASIT ground surveillance radar.

The VAB RATAAC is a mobile firing radar system for field artillery and has a 20-km range Doppler radar on the roof. A generator is on the right side of the hull. A five-man crew includes two radar operators and one radio operator.

The VAB ATILA is a mobile automatic data transmission system fitted out as a mobile data teleprocessing center for various command post levels.

(6) VAB PC (Command Vehicle). This is a basic VAB with mapboards and additional communications equipment, carries a crew of six. It is used as a fire direction center (VAB FDC) and forward observation officer vehicle (VAB FOO), acting as part of the ATILA system. It also mounts parts of the RITA communications system.

(7) VAB Transmission. This model has communications equipment with seats for the operators. It is also used for the RITA Automatic Integrated Transmission Network.

(8) Engineer Vehicle. Called the VAB Genie, this version of the VAB carries engineer equipment and a rubber dingy on the roof. There is a crew of nine.

(9) Electronic Warfare Vehicle. Called the Bromure, this model has a three-man crew with electronic-warfare equipment at the rear.

(10) VAB Sanitaire (Ambulance). This unarmed version carries 4 stretcher or 10 seated patients, or 2 stretcher and 5 seated patients. It has air-conditioning and first-aid equipment.

(11) VMO (Internal Security Vehicle). The Vehicule de Securite export model is fitted with various light armament installations. It may have a Creusot-Loire Industrie TLI 52 A with a 7.62-mm machine gun, or the Creusot-Loire Industrie TLI 52 G turret. A hydraulic obstacle-clearing blade is in front. It has special protection against Molotov cocktails. In the rear and sides are special firing ports with vision blocks. It has a loudspeaker system and optional equipment such as front-mounted winch, heater, air conditioner, and radios. Abu Dhabi has a number of these.

(12) VTM 120 (Mortar Towing Vehicle). This Vehicule Tracteur de Mortier tows a Thomson-Brandt 120-mm mortar, has a six-man crew, and a TLI 52 A turret at the front. The vehicle carries 70 mortar bombs.

(13) VPM 81 (Mortar Carrier). This model has an 81-mm mortar that fires through a two-part opening in the roof. Qatar uses this version in a 6 x 6 configuration with a 7.62-mm machine gun turret in front.

(14) VAB NBC Reconnaissance Vehicle. Called the VAB Reco, this version has nuclear fallout sensors and a series of devices to collect and analyze chemical agents from inside of the vehicle. It should be produced in 1992.

(15) Twin 20-mm SPAAG. The Omani Royal Guard has nine VAB 6 x 6 vehicles with the Electronic Serge Dassault one-man 20-mm turret for use in air defense. Three of these are also equipped with radar.

b. Recognition Features. The key recognition features are as follows:

- Rectangular hull.
- Blunt nose.
- Two or three large wheels with rubber tires on each side.

c. Vehicle Characteristics. The French Army has the basic model 4 x 4 VAB VTT (Vehicule Transport de Troupe). It has a crew of 2 (commander/machine gunner and driver) and holds 10 fully-equipped infantrymen.

The VAB has an all-welded steel hull for small-arms protection. At the front left is the driver. To his right is the commander/machine gunner. Both have a side door opening to the front. The door has a bullet-proof window which is hinged at the top in its upper part. The window opens outward and can be covered with a shutter. Heated bullet-proof windshields in front have a flap hinged at the top. Over the driver is a front-opening hatch cover. The commander has a rotating 7.62-mm machine gun mount.

Behind the driver is the engine compartment that has air inlet and outlet louvers on the roof, and an exhaust pipe running along the top of the hull on the right side. A passageway on the right side of the hull connects the crew compartment with the personnel compartment. Infantrymen



enter and leave the VAB through a double door without a central pillar at the rear of the hull. Each door has a window opening to the outside and covered by an armored shutter.

Infantrymen sit on bench seats along either side of the hull. In the sides are three windows that open to the outside and are covered by armored shutters. Troops can use these to fire small arms. There are three front-opening hatches over the troop compartment. The compartment is 2.46 meters long, 1.375 meters wide and 1.35 meters high. Seats can be quickly folded up for cargo up to 2,000 kg. The French Army also uses the VAB for MILAN anti-tank teams.

Optional equipment includes an air-conditioning system, armored grenade thrower hood, firing gun port with integral observation port, gas dispenser, NBC system (standard for French Army), infrared or passive night vision equipment, public address system, and a 7,000-kg front-mounted winch.

The VAB is fully amphibious. It has two water jets at the rear of the hull, each fitted with a deflector for steering and reverse thrust. Before entering the water, the crew turns on the bilge pumps and erects the trim vane on the bow of the vehicle.

At present, not all of the French VABs are equipped with water jets.

#### **Measurements\***

<u>Crew</u> , 2	<u>Track</u> , 2.035 meters
<u>Passengers</u> , 10	<u>Wheelbase</u> , 3 [1.5 - 1.5] meters
<u>Configuration</u> , 4 x 4 [6 x 6]	<u>Speed, road</u> , 92 km/h
<u>Weight</u> , 13,000 [14,200] kg	<u>Speed, water</u> , 7 km/h
<u>Length</u> , 5.98 meters	<u>Fuel capacity</u> , 300 liters
<u>Width</u> , 2.49 meters	<u>Range</u> , 1,000 km
<u>Height</u> , 2 meters	
<u>Ground clearance</u> , 0.4 meters	

\*Specifications indicated by square brackets [] are for 6 x 6 configured vehicles.

d. Vehicle Capabilities. The VAB can

- cross a 1-meter trench (6 x 6 only).
- mount a .5-meter vertical step.
- climb a 50-percent grade.
- climb a 35-percent side slope.
- ford amphibiously.

e. Armament Characteristics. Armament for the VAB varies. Current production models for the French Army include a 12.7-mm M2 machine gun. Some versions have a 7.62-mm machine gun

mount. Some versions have HOT ATGWs, some have a 25-mm cannon and one 7.62-mm machine gun, some have a 20-mm cannon, while still others have an 81-mm mortar.

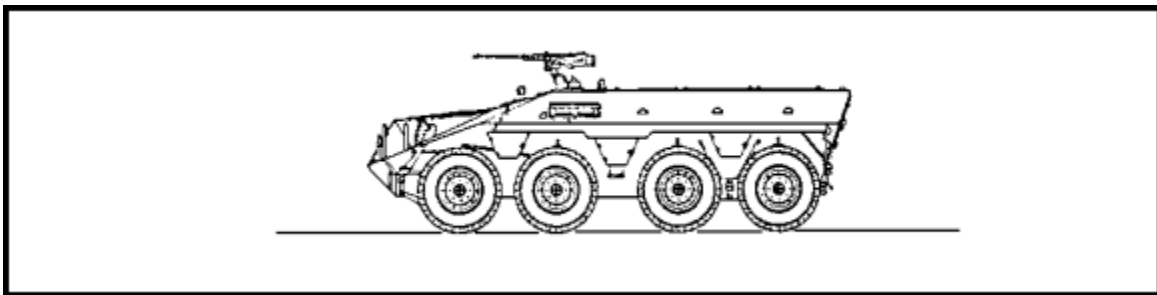
f. Countries Served. The VAB is in service in the following countries:

Brunei	Mauritius
Central African Republic	Morocco
Cyprus	Oman
France	Qatar
Ivory Coast	United Arab Emirates
Lebanon	

The VAB is also in service in other undisclosed countries, including some in the Middle East.

8. YP-408 Armored Personnel Carrier (Netherlands) ([Figure 2-8](#)).

In 1984 the Netherlands Army had eight battalions of YP-408s, but all were due to be phased out by 1989. They are being replaced by FMC armored infantry fighting vehicle (AIFV), called the YPR 765 by the Netherlands Army. Surinam has Five YP-408s. The YP408 APC served in Lebanon where it was painted white for UN troops. Many YP-408s are being refurbished for export.



**Figure 2-8. YP-408 (8 x 8) APC.**

a. Variants. There are several variants of the YP-408. These are discussed in the following subparagraphs.

(1) PWI-S(GR). Pantser Wagen Infanterie-Standaard (Groep) is the Dutch designation for the basic APC.

(2) PWI-S(PC) (Command Vehicle). This platoon commander's vehicle is similar to the PWI-S(GR) but is equipped with additional communications equipment and another periscope is mounted at the rear. The vehicle has a crew of nine, which includes the platoon commander, gunner, driver, and six infantrymen.

(3) PWCO (Command Vehicle). Externally recognizable by its three radio antennas, this company or battalion commander's vehicle has a commander, three staff men, driver and gunner. The seats on the left have been replaced with a folding table, mapboard, and

additional communications equipment. A tent can be erected at the rear. The heater works independently of the main engine. A flexible exhaust pipe prevents gases entering the vehicle when it is stationary.

(4) PW-GWT (Ambulance). This unarmed model has a driver and two medical orderlies. It can carry two stretcher patients and four seated patients. Spare stretchers may be carried on the outside.

(5) PW-V (Freight). Internally the same as the PW-GWT, this can be converted to an ambulance. It does not have a radio as standard equipment. It can carry 1,500 kg of cargo, and is crewed by a driver and a gunner.

(6) PW-MT (Mortar Tractor). This version carries a seven-man mortar team and 50 mortar bombs kept in position with a special rack. The vehicle tows a French 120-mm Thomson-Brandt mortar. The lower part of the rear doors have been shortened to allow them to open when the mortar is being towed.

(7) PWAT (Anti-tank Vehicle). This is the basic APC fitted with the Hughes TOW ATGW system.

(8) PWRDR (Radar). This model has the British ZB298 ground surveillance radar.

b. Recognition Features. The YP-408 has the following recognition features:

- Four large wheels on each side.
- Three trapezoid-shaped tool boxes mounted between the road wheels.
- Sloping glacis plate with protruding engine hood.
- Two rear doors.
- Sloping sides with three troop compartment covers.

c. Vehicle Characteristics. The YP-408 has an all-welded steel hull. The engine is in the front, the driver and gunner are behind the engine, and the personnel compartment is at the rear.

The driver sits to the rear of the engine on the left. The machine gunner is on the right. The driver's hatch cover opens to the left. He has a 360-degree traversable single periscope, one to the front, and another to the left. The driver's seat can be adjusted vertically for driving head out. A canvas cover with window and wiper can be fitted. The gunner has periscopes to the front and left. The gun mount for the 12.7-mm machine gun can be traversed through 360 degrees. The gunner has two hatch covers, each opening vertically to his side for some protection while using the machine gun.

The troop compartment has six hatch covers, three on each side of the roof. Five infantrymen sit on each side of the hull facing each other on bench seats. They enter and exit the vehicle through two doors in the rear which have firing ports.

The YP-408 has eight wheels. The second axle is not driven. If one of the tires of the first axle or rear tandem axle has a puncture, a wheel from the second front axle can be used as an emergency spare. The wheel with the puncture then is fitted on the second axle and suspended

from the hull with a special chain to keep it clear of the ground. The tires have reinforced side walls for driving at a reduced speed of 50 km/h if punctured.

The YP-408 is not amphibious and has no NBC system. It does have a heater. It can be fitted with infrared night vision equipment.

The engine crankcase ventilation can be closed off by the driver from his seat. This creates an over-pressure in the crankcase when there is a risk of water entering the engine. An engine-driven air compressor supplies air to the brake system and also can be used to inflate the tires. Many automotive components of the YP-408 are the same as the DAF YA 328 (6 x 6) tactical truck. Specifications of the YP-408 are:

#### **Measurements**

<u>Crew</u> , 2	<u>Ground clearance</u> , 0.518 meters
<u>Passengers</u> , 10	<u>Speed</u> , 80 km/h
<u>Configuration</u> , 8 x 6	<u>Fuel capacity</u> , 200 liters
<u>Combat weight</u> , 12,000 kg	<u>Range</u> , 400-500 km
<u>Length</u> , 6.23 meters	<u>Tires</u> , 11 x 20
<u>Width</u> , 2.4 meters	<u>Armor</u> , 8-15mm
<u>Hull Height</u> , 1.8 meters	

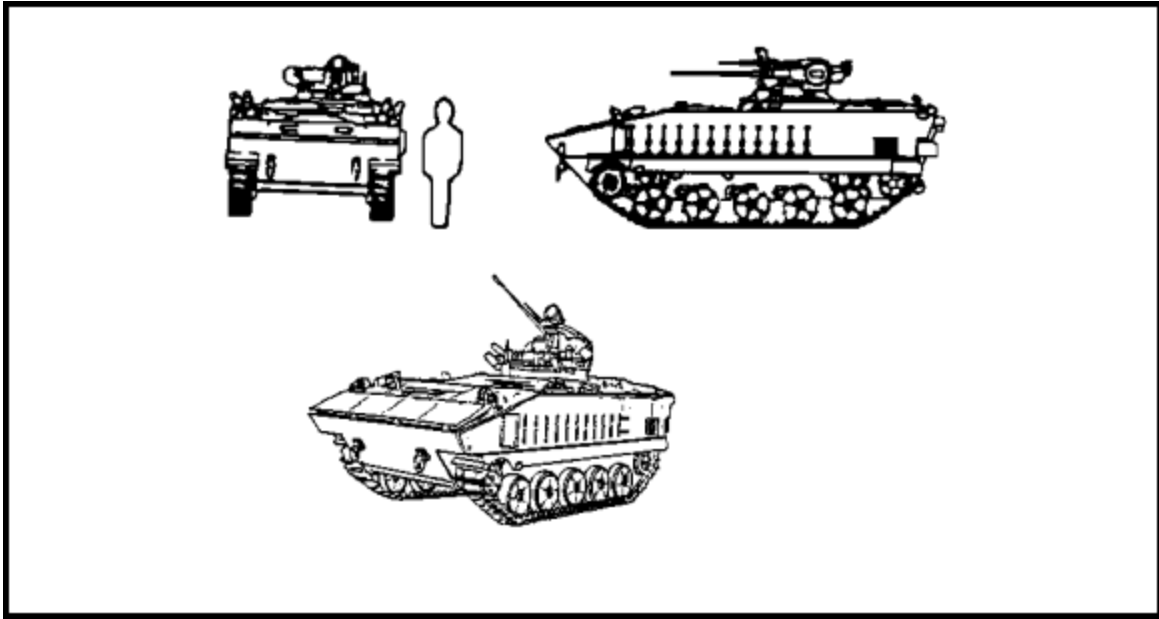
d. Vehicle Capabilities. The YP-408 can

- cross a 1.2-meter trench.
- mount a 0.7-meter vertical step.
- climb a 60-percent grade.
- climb a 70-percent side slope.
- ford 1.2 meters.

e. Armament Characteristics. The YP-408 has a 12.7-mm machine gun. There are three smoke dischargers on each side of the hull front.

f. Countries Served. The YP-408 is in service in the Netherlands and in Surinam.

9. AMX 10P Infantry Combat Vehicle (ICV) (France) (Figure 2-9).



**Figure 2-9. AMX 10P.**

The AMX 10P was developed in 1965 to replace the AMX VCI which was based on the chassis of the AMX 13 light tank.

a. Variants. There are several variants of the AMX 10P. These are discussed in the following paragraphs.

(1) AMX-10P 25 ICV. This is the standard AMX-10P hull without the two-man turret. In the center is a new GIAT Dragar one-man turret with a 25-mm dual-feed cannon which has 175 rounds of high explosive and 45 rounds of armor-piercing ammunition for ready use. Mounted coaxially is a 7.62-mm machine gun with 200 rounds of ready-use ammunition. A thermal camera and stabilized turret are optional. The gunner has four forward periscopes and two rear vision blocks. The commander sits to the left of the turret; has a hatch cover opening to the front, and six periscopes.

(2) AMX-10P Marine. Used by the Indonesian Marines, this version has a Baudouin 6 F11 SRX diesel engine and is specially modified for naval operations. A 12-inch water jet gives a water speed of 10 km/h. The vehicle has reinforced waterproofing, special protection against salt corrosion, four bilge pumps, streamlined track links, new air intakes, side rings, and an emergency pneumatic engine starter. A strong transparent wave breaker on the front can be raised and lowered hydraulically by the driver. In place of the 2-man turret is a turret with externally-mounted 12.7-mm machine gun mounted over the rear troop compartment. The vehicle has a 2-man crew and can carry a 13-man landing party.

(3) AMX-10 Ambulance. This unarmed version has a fixed commander's cupola with three forward vision blocks. There is a driver and two orderlies. There can be three

stretcher patients or one stretcher and four seated patients. The ambulance has air conditioning, a searchlight, washing facilities, oxygen, and blood-transfusion equipment.

(4) AMX-10 ECH Repair Vehicle. This vehicle has the Toucan I one-man turret. There is a crew of five which consists of the commander/chief mechanic, three mechanics, and the driver. There is a 6,000 kg capacity crane mounted on the right side of the roof at the rear. When the crane is being used, two jacks are positioned under the rear of the hull between the ground and the floor of the vehicle. The vehicle is used to change engines on other vehicles of the AMX 10P family. It is also used for changing torsion bars on AMX 10Ps and on AMX 30s.

(5) AMX-10 HOT (Anti-tank). This model is the basic AMX 10P with the Toucan II turret replaced by a new two-man Lancelot turret. It has 4 ready-to-launch HOT missiles and 14 more in the rear of the hull. The crew of five consists of the commander and gunner in the turret, two missile loaders, and the driver. The missiles are launched by the gunner who is seated on the left side of the turret. The gunner has an M509 sight, and the commander has a laser rangefinder with a range of 8,000 meters. The turret also has six periscopes and two vision blocks. The only known user of the vehicle is Saudi Arabia.

(6) AMX-10 PC Command Vehicle. This is the command version of the AMX 10P. It is identical to the basic vehicle except that it has additional communications equipment and a crew of six (two officers, one NCO, two radio operators, and the driver). There is a portable generator mounted on the top of the hull at the rear which is placed on the ground when the vehicle is being used in a static role. Two of the vehicles can be placed back-to-back with a canopy erected between them. In addition, an awning can be erected at the side of the hull.

(7) AMX-10P with RATAC. A roof-mounted Radar For Field Artillery Fire (RATAC) takes place of a turret. The crew consists of a commander, radar operator, assistant radar operator, radio operator, and driver. The radar operates in four modes: ground surveillance, acquisition and identification, angular deviation, and automatic tracking. The radar is in the forward part of the vehicle on the right side, and the radar console is behind it. The plotting table is at the rear of the vehicle on the right. The vehicle also has a navigation system and an identification system. Height including radar is 2.84 meters. At least 24 have been sold to Saudi Arabia.

(8) AMX-10RC. This reconnaissance vehicle is armed with a turret-mounted 155-mm gun. The vehicle has a 6 x 6 configuration and shares many automotive components with the AMX10P.

(9) AMX-10 SAO (Artillery Observation Vehicle). This vehicle is used for battlefield observation and artillery fire control. It is an AMX-10P with its Toucan II turret replaced by a new two-man turret armed with an externally-mounted 7.62-mm machine gun on the right side. There are four electrically-operated smoke dischargers on the top of the turret. The turret has a laser rangefinder with an 8,000-meter range. The rangefinder is coupled to a day sight with a x8 magnification and a night sight with a x4.5

magnification. The turret also has a binocular telescope with a magnification of x2.5 and x10. The crew of five consists of the commander (who normally operates the binocular telescope), second in command (who normally operates the laser rangefinder), two radio operators, and a driver. This vehicle is equipped with a vehicle attitude corrector which enables it to establish its exact position.

(10) AMX-10 SAT (Artillery Survey Vehicle). This is the AMX-10 PC command vehicle modified internally for a gyrostabilized theodolite, topographic survey theodolite, distance measuring equipment, and navigation system.

(11) AMX-10 TM (Mortar Tractor). This version has a Toucan I turret with a 20-mm cannon and a 7.62-mm machine gun. It tows a 120-mm Thomson-Brandt rifled mortar and carries 60 rounds of ammunition. There is a crew of six.

(12) AMX-10 VOA (Artillery Observer Vehicle). This artillery observer vehicle is based on the AMX 10P command vehicle chassis. It has a crew of four, consisting of the commander, the observer, a radio operator, and a driver. The turret is manned by one or two men. The turret has equipment for day and night observation and for local defense. The turret equipment enables the acquisition of target coordinates and the manual or automatic transmission of artillery messages. There is a 7.62-mm machine gun and four smoke dischargers.

(13) AMX-10 SAF. Also known as the AMX-10PC SAF, this model is used with the ATILA artillery fire control system. It has a five-man crew, auxiliary power unit, two air conditioning systems for the electronics and crew, a computer, a data processing center (including screen and keyboard), and three radio sets.

(14) AMX-10 PAC 90 Fire Support Vehicle. This version basically consists of an AMX 10P ICV hull equipped with the GIAT TS 90 turret. The Indonesian Marine models of this vehicle have automotive characteristics and modifications similar to the AMX 10P Marines previously described. The primary role of the AMX 10 PAC is anti-tank and fire support on the battlefield at ranges of between 1,000 and 2,500 meters. It can also be used as a reconnaissance vehicle or as an APC. It can also transport MILAN anti-tank or 81-mm mortar teams.

The 90-mm gun can fire canister, HE, HE long range, HEAT, smoke, and APFSDS ammunition. The turret carries 20 rounds of ammunition, 12 HEAT and 8 HE. Another 10 rounds are carried in the hull. There is a 7.62 machine gun mounted coaxially to the left of the main gun, and there are 2,000 rounds of ammunition for it in the turret and another 1,200 rounds in the hull. The vehicle has two smoke dischargers mounted on each side of the turret toward the rear.

The four infantrymen sit at the rear of the hull. They enter and leave by the large ramp in the hull rear which has two doors, each with a firing port. There are four periscopes in the rear of the troop compartment, one in each side and two at the rear.

b. Recognition Features. The AMX-10P has the following recognition features:

- Fully tracked.
- Five road wheels and three return rollers.
- Low silhouette.
- Sloped front.
- Turret mounted on the left side of the chassis over the fourth road wheel.
- Turbine engine.
- Trim vane on the front slope for amphibious operations.

c. Vehicle Characteristics. The hull of the AMX 10P is made of all-welded aluminum. The driver's compartment is at the front of the vehicle on the left. The engine compartment is to his right. The troop compartment is at the rear of the hull. In front of the driver are three periscopes. Air inlet and outlet louvers are on top of the hull, and the exhaust outlet is in the right side of the hull. The complete powerpack can be replaced in two hours.

In the center, offset slightly to the left, is a two-man Toucan II turret. The gunner sits on the left and commander on the right. Both their hatch covers open to either side. The commander has a telescopic sight, a direct anti-aircraft sight, and a direct-fire external sight. The gunner has a periscope with various possible sight combinations. The commander and gunner also have seven periscopes for all-around view.

The AMX-10P is fully amphibious, but can be delivered without this capability. It is propelled by two water jets on either side of the ramp. Bilge pumps are in the engine and troop compartments. A trim vane is erected at the front, and stowed on the glacis plate when not in use. Standard equipment includes a heater and NBC system on the right side. Some key specifications are:

#### **Measurements**

<u>Crew</u> , 3	<u>Track width</u> , 420mm
<u>Passengers</u> , 8	<u>Track length on ground</u> , 3 meters
<u>Combat Weight</u> , 14,500 kg	<u>Road speed</u> , 65 km/h
<u>Hull length</u> , 5.78 meters	<u>Water speed</u> , 7 km/h
<u>Hull width</u> , 2.78 meters	<u>Fuel capacity</u> , 528 liters
<u>Overall height</u> , 2.6 meters	<u>Maximum road range</u> , 600 km
<u>Ground clearance</u> 0.45 meters	

d. Vehicle Capabilities. The AMX-10P can

- cross a 2.1-meter trench.
- mount a 0.7-meter vertical step.
- climb a 60-percent grade.
- climb a 30-percent side slope.
- ford amphibiously.



e. Armament Characteristics. Mounted externally on the turret is the 20-mm cannon. The gunner can select either high-explosive or armor-piercing rounds. He has a burst selector and a cyclic rate of fire of 700 rounds per minute. Maximum effective range is 1,500 meters. The turret carries 325 rounds of ready ammunition.

Above and to the right of the cannon is a 7.62-mm machine gun that fires 900 rounds per minute and has an effective range of 1,000 meters. A small searchlight is mounted coaxially with these guns. Two smoke dischargers are on either side of the forward part of the turret. The basic AMX-10P may also carry two Euromissile MILAN launchers with 10 missiles carried in the hull.

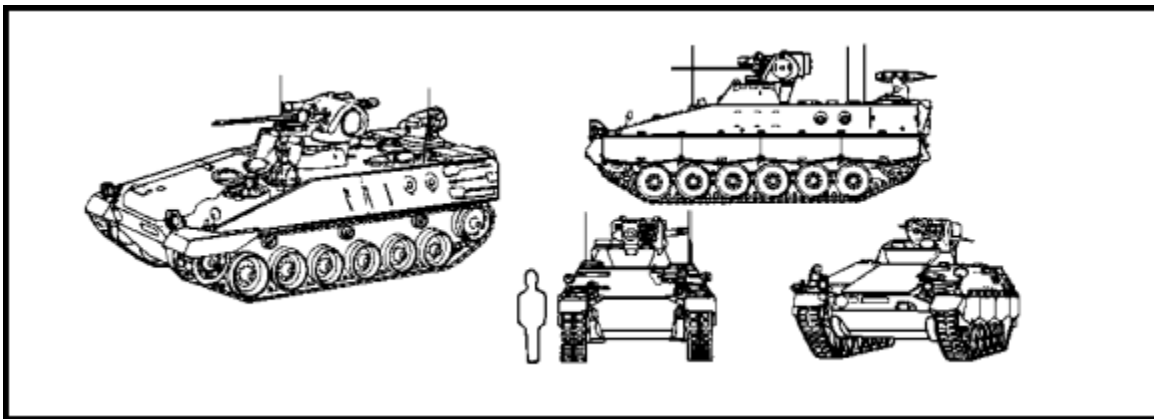
f. Countries Served. The AMX-10P is in service with:

France	Saudi Arabia
Indonesia	United Arab Emirates
Qatar	

10. Marder Infantry Combat Vehicle (Germany) (Figure 2-10).

The Marder infantry combat vehicle was built on a chassis which could be used for a number of basic vehicles. A new version called the Marder 2 is under development and will begin replacing the current vehicles in the German Army in the mid 1990s.

The Marder shown in [Figure 2-10](#) has a 7.62-mm machine mounted on the rear. These machine guns are being removed.



**Figure 2-10. Marder Infantry Combat Vehicle.**

a. Variants. The following subparagraphs describe the variants of the Marder.

(1) A1 Upgrade. This four-crew model carries five infantrymen. It weighs 30,000 kg. Some 674 vehicles were upgraded to this standard. Main improvements include:

- Better firepower from a double-belt feed for the 20-mm cannon.
- Improved night capabilities with the installation of the PERI Z 59 night sight which uses image intensification technique with thermal pointer.

- Remaining active infrared searchlight and sight are retained.

(2) A1A. The previous modifications were made to 1,112 vehicles, except that the passive vision equipment was not installed. All German Army Marders, except command vehicles, carry MILAN ATGW systems that reduce the number of infantrymen carried from six to five.

(3) A2. This modification includes the thermal imaging sight equipment instead of image-intensification equipment. The infrared searchlight on the left side of the turret is removed and the chassis and suspension are modified.

(4) A3. Starting in 1989, an armor package is being added to 2,100 Marders. To provide protection from the BMP-2 30-mm cannon, the 1,600-kg package includes the following:

- Frontal armor on the hull.
- Add-on armor on the glacis plate.
- Conformal add-on armor on both sides of the turret.
- Three box-type armor components on both sides of the hull. These block off the hull firing ports.
- Spaced armor plates on the roof to cause premature detonation of top attack rounds.
- Add-on armor with a stowage compartment at the rear door.

(5) Marder with Radar System. The Radarpanzer TUR (Tiefflieger-Überwachungs-Radar) is an extensively-modified raised hull with a large hydraulic arm that raises a rotating acquisition radar to approximately 10 meters above ground. The RadarPz TUR hull was raised to accommodate the hydraulic, cooling, radio and data processing, power supply, display, and control equipment. The system is expected to enter service in the early 1990s and support the Roland and Gepard air defense systems. Basic specifications are:

Crew, 4

Length, 7.2 meters

Width, 3.27 meters

Height, 3.58 meters

Range, 570 km

Armament, two banks of smoke dischargers at hull rear, 7.62-mm machine gun on each cupola.

(6) Marder with LWT-3 Turret. This vehicle is a Marder equipped with a new turret armed with a 20-mm cannon which is fully stabilized. LWT-3 stands for Light Weapon Turret with three-axis stabilization.

(7) Roland Surface-to-air Missile System. The German Army has 144 Roland systems. Two missiles are at the ready-to-launch position, and another eight are in the hull ready for automatic loading. A rotating acquisition radar is mounted above a target dish radar that sits between two arms holding the missile tubes.

(8) TAM Medium Tank Family. The Tanque Argentino Mediano (TAM) developed for the Argentinean Army is described in Lesson One. Thyssen Henschel also developed 300 VCTP ICVs for Argentina. The VCTP is similar to the Marder but it has the following modifications:

- a more powerful 720-hp engine.
- a less sophisticated two-man turret with a 20-mm cannon and a 7.62-mm anti-aircraft machine gun.
- three gun ports in each side of the troop compartment.
- two rectangular roof hatches hinged on the outside.
- a remote-controlled 7.62-mm machine gun at the hull rear.
- a capacity of 12 men including the crew.
- 75 km/h maximum road speed.
- two rear fuel tank drums for an increased range of 800 km.

The TAM/VCTP chassis has been used for a range of vehicles, including:

- 155-mm self-propelled gun (using the turret of the French 155-mm GCT).
- 57-mm Support Tank, or Begleitpanzer.
- 57-mm anti-aircraft vehicle.
- Dragon twin 30-mm self-propelled anti-aircraft gun system.

b. Recognition Features. The Marder has the following recognition features:

- Fully tracked.
- Six road wheels with three support rollers.
- Gun mounted on the turret.
- Two firing ports on each side.
- Long hull with inward-sloping sides.
- Remote-controlled machine gun facing the rear.

c. Vehicle Characteristics. The driver sits in the front left side of the hull. His hatch cover opens to the right, and in front of him are three periscopes. To his rear sits one infantryman who has a hatch cover opening to the right, and a periscope traversable through 360 degrees.

A two-man turret on the forward part of the roof holds the commander on the right and gunner on the left. The commander's hatch cover opens to the right, and the gunner's to the rear. The commander has eight periscopes for all-around viewing, and the gunner has three.

The Marder hull protects against small-arms fire and shell splinters. The front protects against 20-mm projectiles. Six infantrymen sit in the rear troop compartment, three on each side facing outward. Their seats can be adjusted so four men can sleep.

A power-operated ramp at the rear opens downwards. On either side of the roof are two circular roof hatches and three periscopes. Two spherical firing ports are on each side are used in conjunction with periscopes for four infantrymen to use their weapons in complete safety. All Marders have an NBC system.

A cooling fan sucks air through grills on top to the radiators mounted at the rear of the hull, one on each side of the ramp.

### **Measurements**

<u>Crew</u> , 9	<u>Track width</u> , 450mm
<u>Combat weight</u> , 29,207 kg	<u>Track length on ground</u> , 3.9 meters
<u>Length</u> , 6.79 meters	<u>Speed</u> , 75 km/h
<u>Width</u> , 3.24 meters	<u>Fuel capacity</u> , 652 liters
<u>Height</u> , 1.9 meters (hull)	<u>Range</u> , 520 km
<u>Track</u> , 2.62 meters	

d. Vehicle Capabilities. The Marder can

- cross a 2.5-meter trench.
- mount a 1-meter vertical step.
- climb a 60-percent grade.
- climb a 30-percent side slope.
- ford 1.5 meters.
- ford 2.5 meters with preparation.

e. Armament Characteristics. The externally-mounted 20-mm Rheinmetall MK 20 Rh 202 cannon elevates from -17 to +65 degrees, and traverses 360 degrees. Three different belts feed the cannon, so the gunner can select types of ammunition such as armor piercing or high explosive. The gun is sighted by the use of various periscopes including infrared night vision.

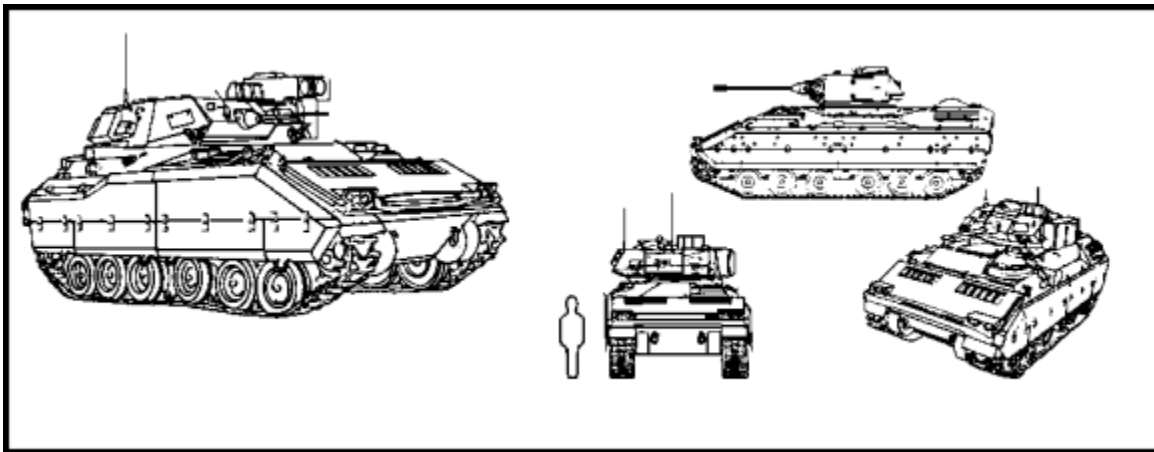
Coaxially mounted above and to the right of the cannon is a 7.62-mm machine gun. To the left of the cannon are six smoke dischargers. Also to the left of the gun is a searchlight, which is removed when the thermal sight is added. A remote-controlled 7.62-mm machine gun was mounted on top in the rear, but these turrets are now being removed.

The West German Army fitted all Marders except command vehicles with a Euromissile MILAN ATGW launcher.

f. Countries Served. The Marder is used in Germany, Argentina, and Brazil.

11. M2 and M3 Bradley Fighting Vehicles (U.S.) (Figure 2-11).

M2 is the designation for the infantry fighting vehicle (IFV), and M3 is the cavalry fighting vehicle (CFV). The two vehicles are externally identical.



**Figure 2-11. M2 Bradley IFV.**

a. Variants.

(1) M2A1 and M3A1 Bradleys. First delivered in 1986, the M2A1 and M3A1 can fire all versions of the Hughes TOW ATGW, including the full-diameter TOW 2 with maximum range of 3,750 meters.

Both models have an improved NBC system. The M2A1 has a central NBC system for the commander, gunner, and driver, while the dismounted infantrymen in the rear have their own NBC suits and masks which allow them to leave the vehicle quickly.

Other improvements include:

- Turret power indicator.
- Padding for the driver's station.
- Redesigned weapons interlock and top deck clearance arrangements.
- Simplified stowage strapping.
- New on-board rations.
- Two camouflage nets.
- Replacement of the single water tank by two smaller ones with the same total capacity.

The M2A1 has the Dragon AN/TAS-5 night sight, and up to five Dragons are carried in place of TOWs. Mine and flare stowage was re-arranged for more mines and fewer flares. The M3/M3A1 does not have the firing ports and associated vision blocks of the M2/M2A1. This cavalry version has two individual seats with four periscopes in the missile loading hatch. The M2A1/M3A1 also has revised fuel and fire-suppression systems.

A second set of improvements starting in 1988 included:

- Enhanced vehicle survivability by restowing ammunition and fuel.
- Internal armor protection of key components.
- Spall liners and improved vehicle smoke screening.
- Additional armor protection including explosive-reactive armor for hull and turret.
- A ballistic shroud to be provided for the commander's back-up sight.
- Introduction of a new 25-mm round.
- Improved drive train and suspension.

(2) High Survivability Bradley. This vehicle features additional armor protection. This increases the weight to approximately 30,000 kg. It is powered by a 600 horsepower engine instead of the 500 horsepower production model.

(3) Multiple Launch Rocket System. The MLRS (M993) has been designed for the Bradley in forward battlefield areas. It is carried on the M987 Fighting Vehicle Systems Carrier. Another member of this family is the Armored, Forward-Area, Rearm Vehicle (AFARV) which rearms main battle tanks and other vehicles. Recent variants on this chassis in the testing stages are the Armored Maintenance Vehicle and the Electronic System Carrier.

(4) Bradley Air Defense Vehicle. The U.S. Army selected the Bradley chassis to mount a Oerlikon-Buhrle ADATS air defense system. It is a power-operated turret with electro-optics in the center and four ADATS missiles in the ready-to-launch position either side of the turret.

b. Recognition Features. In the front left sits the driver with a rear-opening hatch cover. He has four periscopes, three to the front and one to the left side.

The turret is in the center on the right side of the vehicle. The gunner sits on the left, and the commander on the right, each with a rear-opening hatch cover. Each have periscopes to the front and side. The gunner has a day/thermal night sight with optical relay for the commander. Main features are:

- Fully tracked.
- Six road wheels (gap between third and fourth road wheels).
- Straight skirting.
- Center-mounted turret with a TOW launcher on the left side.
- Amphibious.
- 25-mm gun.

c. Vehicle Characteristics. The hull of the M2 is made of all-welded aluminum armor with spaced laminate armor fitted to the hull, sides, and rear. The manufacturer claims that the armor can defeat 95 percent of all the types of ballistic attack encountered on the battlefield under IFV/CFV doctrine. Latest production M2A2/M3A3 Bradleys have an additional layer of applique steel armor, plus explosive-reactive armor.

The M2 holds seven infantrymen. The M2A2 holds a six-man squad after elimination of the seat to the rear of the driver's position.

The commander dismounts with the infantrymen through the rear. A large hydraulic ramp has an integral door in the left side. Over the top of the troop compartment is a rear-opening hatch cover. There are six firing ports: two in each side of the hull and two at the rear. Each has a periscope over it, enabling infantrymen to fire M231 5.56-mm weapons from inside. The M2A2 has no side firing ports, but retains the two in the ramp.

Torsion-bar suspension on each side supports six dual rubber-tired road wheels, with drive sprocket in front. There are two track-return rollers. Hydraulic shock absorbers are on the first, second, third, and sixth road wheels. The single-pin tracks have replaceable rubber pads.

The M2 is amphibious and propelled in the water by its tracks. A special water barrier can be erected in about five minutes. The M2A2/M3A2 has a redesigned water barrier. Another program is looking at inflatable bags which would be attached to the armored skirts on each side. These can be inflated with a simple onboard blower in less than four minutes without the crew leaving the vehicle. When afloat, the bags will be completely submerged under water. If one is punctured by small arms fire, it will be topped up with air by the blower.

When airlifted in the C-141 Starlifter, the head of the gunner's integral sight, and the skirt plates are removed in all road arm positions (six each side) are snubbed in the up position using the steel cables provided.

#### Measurements\*

<u>Crew</u> , 3,	<u>Ground clearance</u> , 0.432 meters
<u>Passengers</u> , 6 [2]	<u>Road speed</u> , 66 km/h
<u>Combat weight</u> , 22,590 [22,443] kg	<u>Water speed</u> , 7.2 km/h
<u>Length</u> , 6.453 meters	<u>Fuel capacity</u> , 662 liters
<u>Width</u> , 3.2 meters	<u>Range</u> , 483 km
<u>Height to turret roof</u> , 2.565 meters	<u>Armor</u> , aluminum or laminate
	* [ ] indicates M3.

d. Vehicle Capabilities. The Bradley can

- cross a 2.54-meter trench.
- mount a 0.914-meter vertical step.
- climb a 60-percent grade.
- climb a 40-percent side slope.
- ford amphibiously.

e. Armament Characteristics. The main gun is a McDonnell Douglas Helicopter Company M242 25-mm Chain Gun. Mounted coaxially to the right is a 7.62-mm M240C machine gun. The 25-mm automatic cannon has dual feed and fires various armor-piercing and high-explosive ammunition at a range up to 3,500 meters. The M791 APDS-T ammunition can defeat the BMP-

1 at a range of 2,500 meters. The gunner can select single shots, 100, or 200 rounds-per-minute rates of fire. Empty cartridge cases are automatically ejected outside. Maximum effective range is 1,400 meters. The turret has a stabilization system which allows firing while on the move.

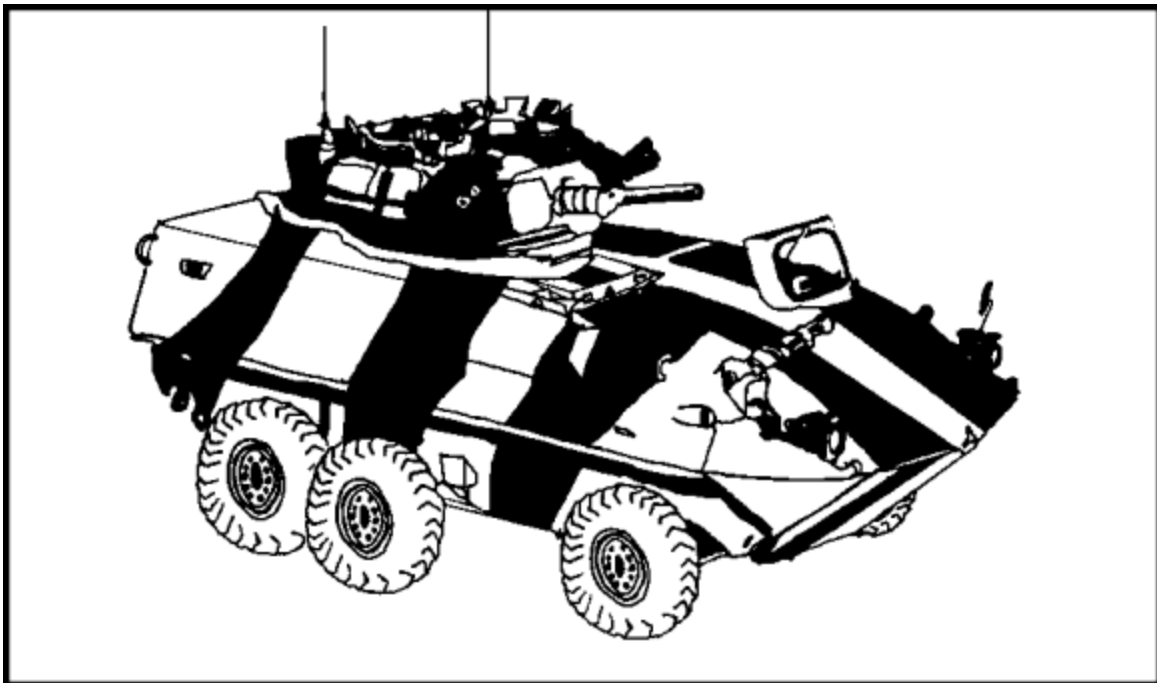
The Bradley also has the Hughes TOW with a twin tube launcher retracted along the left side of the turret when not in use. The TOW can engage enemy armor out to 3,750 meters.

On the front of the turret are two smoke dischargers, with four smoke grenades in each. Also there is an engine smoke-generating system similar to that on most former Soviet vehicles.

f. Countries Served. The Bradley is in service with the U.S. Army and on order with Saudi Arabia.

## 12. Wheeled Light Armored Vehicles (Canada) (Cougar, Grizzly, and Husky).

The Canadian Armed Forces selected a Swiss MOWAG Piranha (6 x 6) as a basis for an armored vehicle, general purpose (AVGP). The Canadians have three versions of the Piranha. They are the Cougar 76-mm gun, wheeled fire support vehicle (WFSV), the Grizzly wheeled armored personnel carrier (WAPC), and the Husky wheeled maintenance and recovery vehicle (WMRV). The Cougar is shown in [Figure 2-12](#).



**Figure 2-12. Cougar Wheeled Fire Support Vehicle.**

a. Variants. The three versions are discussed in the following subparagraphs.

(1) Cougar 76-mm Gun Wheeled Fire Support Vehicle (WFSV). A total of 195 Cougars were built. It is the basic vehicle fitted with basically the same turret used on the British CVR(T) Scorpion and the Australian M113A1 fire support vehicle. The turret has a 7.62-mm machine gun mounted coaxially to a 76-mm L23A1 main gun and four smoke



dischargers on either side. Ten rounds of 76-mm and 220 rounds of 7.62-mm ammunition are carried in the turret, and 30 rounds of 76-mm and 15 boxes of 7.62-mm ammunition are in reserve in the hull. The Cougar has a crew of three. It carries a laser rangefinder.

(2) Grizzly Wheeled Armored Personnel Carrier (WAPC). This is the basic vehicle fitted with a Cadillac Gage 1m turret armed with a 12.7-mm machine gun, a 7.62-mm machine gun, and four smoke dischargers on either side. The Grizzly carries 10 boxes of 12.7-mm ammunition and 18 boxes of 7.62-mm ammunition. The hull sides and rear have firing ports and vision blocks. The Grizzly has a three-man crew, and carries eight fully-equipped infantrymen.

(3) Husky Wheeled Maintenance and Recovery Vehicle (WMRV). This vehicle has a crew of three. It is equipped with a 4,536-kg capacity crane. The vehicle is used for field repair and recovery work.

b. Recognition Features. Some key features are:

- Three road wheels on each side with a large gap between the first and second.
- Long glacis.
- Two-man turret.
- Two gun ports on each side.

c. Vehicle Characteristics. All vehicles have heaters for the engine and crew compartment and are fitted with cold-starting aids. They have an AN/VVS-501 passive night-driving periscope for the driver.

#### **Measurements**

<u>Crew</u> , 3	<u>Width</u> , 2.53 meters
<u>Passengers</u> , 6	<u>Height</u> , 2.53 meters
<u>Configuration</u> , 6 x 6	<u>Road speed</u> , 101.5 km/h
<u>Combat weight</u> , 10,500 kg	<u>Water speed</u> , 7 km/h
<u>Length</u> , 5.968 meters	<u>Fuel capacity</u> , 204 liters
<u>Ground clearance</u> , 0.392 meters	<u>Range</u> , 603 km
	<u>Armor</u> , 8 to 10mm

d. Vehicle Capabilities. The Cougar/Grizzly/Husky can

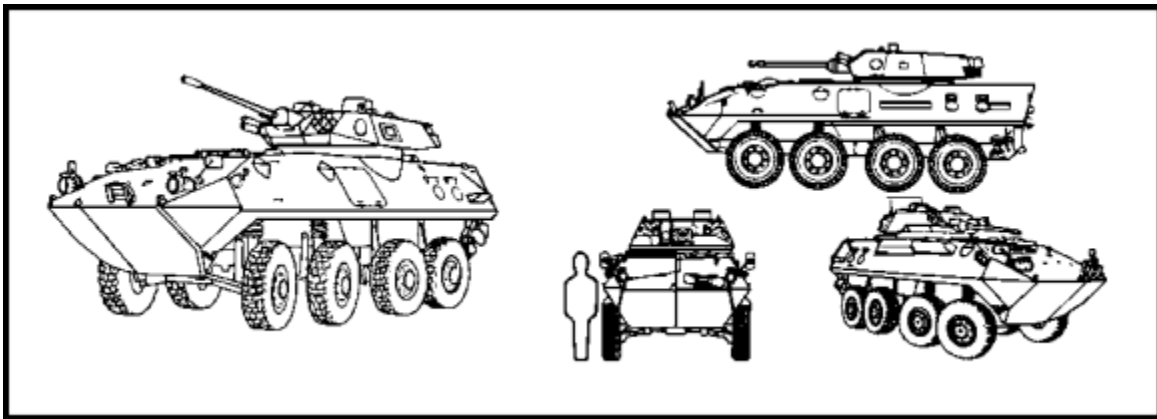
- cross a 0.406-meter trench.
- mount a 0.381 to 0.508-meter vertical step.
- climb a 60-percent grade.
- climb a 30-percent side slope.
- ford amphibiously.

e. Armament Characteristics. The armament of the three vehicles is described in the paragraph on variants above.

f. Countries Served. The Cougar/Grizzly/Husky vehicles are used by Canada.

13. LAV-25 Canada/U.S. (Figure 2-13).

The LAV-25 is a light armored vehicle that is air transportable in current U.S. Air Force cargo transports. The C-5A can carry eight, the C-141 two, and the C-130 carries one. The U.S. Marine Corps CH-53E helicopter can transport one LAV-25 in the sling position. The LAV-25 has also been successfully air-dropped and was operational within 12 minutes. The vehicle is used by the U.S. Marine Corps. It has an 8 x 8 configuration, and it is based on the Piranha, which was previously described.



**Figure 2-13. LAV-25.**

a. Variants. There are several variants of the LAV-25, and they are described below.

(1) Logistics Vehicle. This vehicle has a higher roof with twin hatches for the rapid loading and unloading of cargo. The crew of three consists of the commander, driver, and loadmaster. There is a crane for loading and unloading cargo at the left rear of the hull. Armament consists of a pintle mounted 7.62-mm machine gun and two four-barrelled smoke grenade launchers.

(2) Mortar Carrier. This version has a crew of four consisting of the commander, driver, and three mortar men. The vehicle carries an 81-mm mortar and 94 rounds of ammunition. The mortar is mounted in the center of the vehicle, and fires through the three-part roof hatch. There is also a pintle-mounted 7.62-mm machine gun and two four-barrelled smoke grenade launchers.

(3) Maintenance/Recovery Vehicle. This vehicle has a crew of five. There is the commander, the driver, and two mechanics. There is a 7.62-mm pintle-mounted machine gun and two four-barrelled smoke grenade launchers. The vehicle is equipped with a portable auxiliary power unit, a crane with a 1,814 kg capacity, and a rear-mounted

winch with a capacity of 13,608 kg. There are four stabilizers to provide a more stable platform when the crane is in use.

(4) Anti-Tank Vehicle. This vehicle has an Emerson twin TOW launcher mounted on top of the hull above the third wheel. The launcher carries two ready-to-launch missiles, and there are 14 more missiles in the hull. Secondary armament consists of a 7.62-mm or a 12.7-mm machine gun on a pintle and two four-barrelled smoke dischargers. The vehicle also carries a ground mount for the TOW and a hand-held laser rangefinder. The vehicle has a crew of four consisting of the driver, commander, gunner, and loader.

(5) Command and Control Vehicle. This version has a similar hull to the logistics vehicle, and has extensive communications equipment installed. The crew consists of the vehicle commander and driver. There is space for a unit commander and four staff members or radio operators. Armament consists of one pintle-mounted 7.62-mm machine gun and two four-barrelled smoke dischargers.

b. Recognition Features. The LAV-25 has the following recognition features:

- Four large wheels on each side.
- Amphibious.
- Boat-shaped hull.
- Two water-propulsion propellers at the rear.
- Rear-mounted turret.
- Four gun ports on each side.
- High center of gravity.

c. Vehicle Characteristics. The U.S. Army designation for this vehicle was the M1047. The Army version and the Marine Corps versions were very similar. The Army version had increased ammunition stowage, but was not intended to carry troops. The LAV has a 275 horsepower diesel engine which could be increased to 300 horsepower by charged injection. In Marine Corps winter mobility tests, it took an average of 15 minutes to install chains on the tires. The chains improved the mobility of the LAV in snow and did no damage to hard surface roads or the vehicles.

#### **Measurements**

<u>Crew</u> , 3	<u>Width</u> , 2.499 meters
<u>Passengers</u> , 6	<u>Height</u> , 2.692 meters
<u>Configuration</u> , 8 x 8	<u>Road speed</u> , 100 km/h
<u>Combat weight</u> , 12,882 kg	<u>Water speed</u> , 10.46 km/h
<u>Length</u> , 6.393 meters	<u>Range</u> , 668 km

d. Vehicle Capabilities. The LAV can

- cross a 2.057-meter trench.
- mount a 0.5-meter vertical step.

- climb a 70-percent grade.
- ford amphibiously.

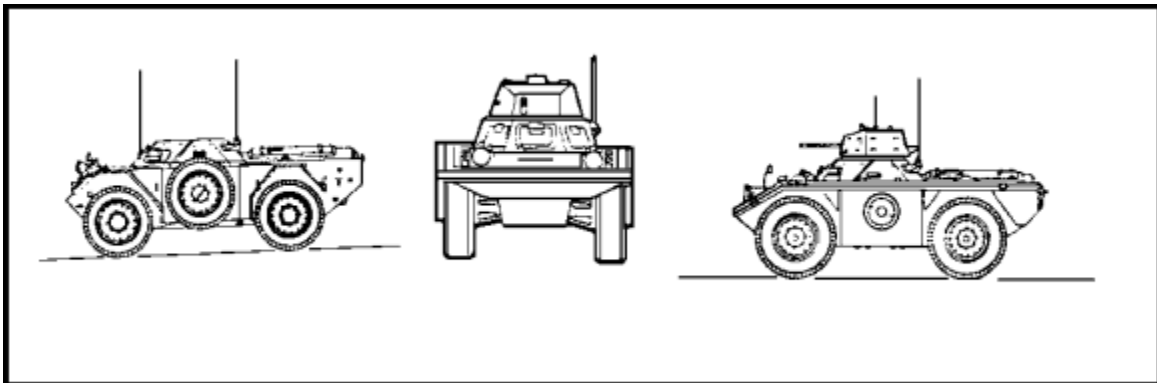
e. Armament Characteristics. The Marine Corps LAV-25 has a Delco two-man turret armed with a 25-mm McDonnell Douglas Helicopter Chain Gun, a coaxially-mounted 7.62-mm M240 machine gun, and a pintle-mounted 7.62-mm M60 machine gun. A bank of M257 smoke dischargers are on either side of the turret. A stabilization system allows aiming of the 25-mm cannon while traveling cross country. There are 210 rounds of 25-mm ammunition in the ready-to-use position, and 420 rounds stowed.

There are 420 ready-to-use rounds of 7.62-mm ammunition, 1,200 rounds stowed.

f. Countries Served. The LAV-25 is used by the United States.

#### 14. Daimler Ferret Scout Car (U.K.) (Figure 2-14).

A replacement for the Daimler Dingo scout car of World War II, the Daimler Ferret was produced from 1952 to 1971. Throughout its production life, the basic hull remained unchanged, but more powerful engines and different turrets were installed.



**Figure 2-14. Daimler Ferret Mk 1 (left) and Mk 4 Scout Cars.**

a. Variants. The several variants of the Ferret are discussed in the subparagraphs below.

(1) Ferret Mk 1. An open top which may be covered by canvas is featured on this version also called Car Scout 4 x 4 Liaison FV701(C). It has a 7.62-mm Bren machine gun or a 7.62-mm (.30-cal) Browning machine gun with 450 rounds.

(2) Ferret Mk 1/2 (FV704). This vehicle is identical to the Mk 1 except for a three-man crew, this variant is designated Car Scout Liaison Mk 1/2. There is an armored roof with periscopes, vision blocks, and rear-opening hatch cover.

(3) Ferret Mk 2. This is basically a Mk 1 fitted with a turret. It is officially known as the Car Scout 4 x 4, Reconnaissance (Ferret) Mk 2 FV701(E).

- (4) Ferret Mk 2/2. This was a local modification carried out in the Far East. It is basically the Ferret Mk 2 with an extension collar fitted between the top of the hull and the machine gun turret to enable the commander/gunner to have a better field of fire.
- (5) Ferret Mk 2/3. Officially designated Scout Car Reconnaissance Mk 2/3 (Daimler Ferret 4 x 4)FV701(H), this is the later production model of the Mk 2.
- (6) Ferret Mk 2/4. This is a Ferret Mk 2/3 with additional armor.
- (7) Ferret Mk 2/5. This is a Ferret Mk 2 brought up to Ferret Mk 2/4 standards.
- (8) Ferret Mk 2/6 (FV703). Designated Scout Car Reconnaissance/Guided Weapon Mk 2/6, this model is a Mk 2/3 with one Vigilant ATGW ready-to-launch missile on each side of the turret. In place of the spare wheel on the left side are two more missiles. The wire-guided missile has a range of 200 to 1,375 meters. The last known users were Libya and the United Arab Emirates, but they may have been placed the vehicles in reserve.
- (9) Ferret Mk 3/7. This is a Ferret Mk 2/6 with the missile system removed. It is, therefore, basically a Ferret Mk 2/3.
- (10) Ferret Mk 3. This is the Mk 1/1 improved to Mk 4 standards with a machine-gun turret.
- (11) Ferret Mk 4 (FV711). This model is an early Ferret rebuilt with stronger suspension, disc brakes, and large tires. Around the top of the hull is a collapsed flotation screen that provides the vehicle the capability to propel itself across lakes and rivers by its wheels. Watertight stowage containers are on either side of the hull, and servicing points have been reduced.

b. Recognition Features. The Ferret has the following recognition features:

- Two large wheels on each side.
- A spare wheel center-mounted on the left side.
- Square sides.
- Some have turrets, some do not. Turret is flat-topped and angular shaped.
- Angular shaped hull.

c. Vehicle Characteristics. The Ferret has an all-welded steel hull that is divided into three compartments: the driver's compartment in the front, the fighting compartment in the center, and the engine compartment in the rear. The driver sits in front with three hatches: one in front and one on each side. Each hatch has an integral periscope. The front hatch may be folded down onto the glacis plate. This can be fitted with a splinter-proof windscreen with wiper blade and electric motor. The two side hatches open upwards when not in a combat area.

In the center is a manually-operated turret. A hatch cover in the roof rear can be locked in three different positions. A rear part of the turret folds down horizontally for use as a seat. In front of the turret roof is a sight periscope for aiming the turret-mounted machine gun. A vision slit with glass block is in each side of the hull below the turret ring. Two hatches are at the rear of the

fighting compartment. A hull escape hatch is on each side between the front and back wheels. These are covered by a spare tire on the left and a stowage box on the right.

The basic scout car has no NBC system, no night vision equipment, and no amphibious ability. A deep-fording kit has a collapsible bellows-type collar that goes around the top of the commander's hatch. Another fits at the very rear of the hull. The Ferret Mk 3 and Mk 4 models have a collapsible screen that goes around the top of their hulls which allows travel across lakes and rivers using their wheels for propulsion. The Ferret Mk 1, 2, and 3 can carry steel channels on the front that are used for crossing trenches.

A Rolls-Royce B60 Mk 6A six-cylinder in-line water-cooled gas engine develops 129 horsepower at 3,750 rpm. Drive is transferred to all four wheels with a fluid-coupling transmission having five speeds in each direction. The waterproof engine will run when completely submerged without any preparation other than venting the crankcase breather pipe. Run-flat tires are each suspended with a shock absorber and single coil spring.

#### Measurements

<u>Model</u>	<u>Mk1/1</u>	<u>Mk 1/2</u>	<u>Mk 2/3</u>	<u>Mk 2/6</u>	<u>Mk 4</u>
<u>Crew</u>	2 - 3	3	2	2	2
<u>Configuration</u>	4 x 4	4 x 4	4 x 4	4 x 4	4 x 4
<u>Weight (kg)</u>	4,210	4,370	4,400	4,560	5,400
<u>Length (m)</u>	3.835	3.835	3.835	3.835	3.96
<u>Width (m)</u>	1.905	1.905	1.905	1.905	2.134
<u>Height (m)</u>	1.448	1.651	1.879	1.879	2.03
<u>Ground Clearance</u>	0.33	0.33	0.33	0.33	0.432
<u>Speed (km/h)</u>	93	93	93	93	80
<u>Fuel (liters)</u>	96	96	96	96	96
<u>Road Range (km)</u>	306	306	306	306	306
<u>Cross Country Range (km)</u>	160	160	160	160	160

#### Armor

<u>Hull</u>	<u>Turret</u>
<u>Front,</u> 12-16mm	<u>Front,</u> 16mm
<u>Sides,</u> 12-16mm	<u>Sides,</u> 16mm
<u>Floor,</u> 6-10mm	<u>Rear,</u> 16mm
<u>Rear,</u> 6-12mm	<u>Top,</u> 8mm

d. Vehicle Capabilities. The Ferret can

- cross a 1.22-meter trench (with channels).
- mount a 0.406-meter vertical step.
- climb a 46-percent grade.
- ford 0.914 meters without preparation.
- ford 1.524 meters with preparation (Mk 4 is amphibious).

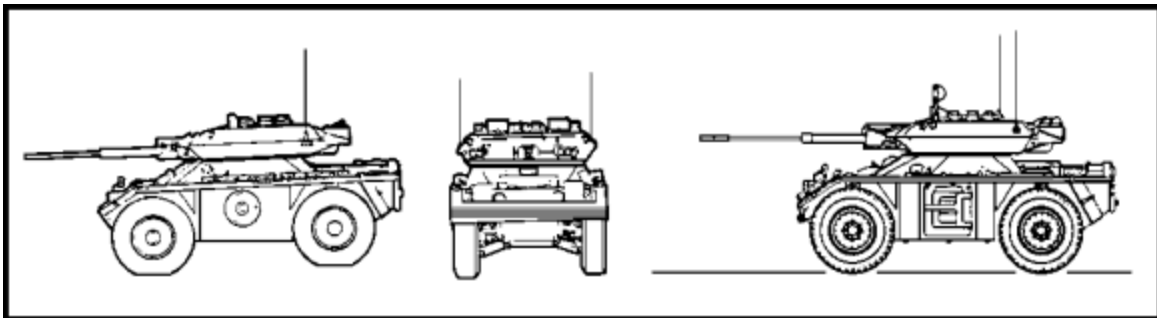
e. Armament Characteristics. The Mk 2 has a 7.62-mm Browning machine gun mounted on the turret. It traverses 360 degrees and elevates from -15 to +45 degrees. The Ferret generally carries 2,500 rounds. Three smoke dischargers are on either side of the hull.

f. Countries Served. The scout car is in service with the following countries.

Bahrain	Portugal
Burkina Faso	Qatar
Burma	Senegal
Cameroon	South Africa
Central African Republic	Sri Lanka
Indonesia	Sudan
Kuwait	United Arab Emirates
Madagascar	United Kingdom
Malaysia	Yemen, North
New Zealand	Zimbabwe

15. Fox Light Armored Car (U.K.) ([Figure 2-15](#)).

The Fox is air portable and normally operates attached to armored and mechanized infantry battalions. The Fox armored car is a further development of the Ferret light scout car. The Fox has an all-welded aluminum armor hull and turret that protects against medium and heavy machine gun fire and field artillery splinters.



**Figure 2-15. Fox Light Armored Car.**

a. Variants. The four variants of the Fox light armored car are discussed in the following subparagraphs.

(1) Panga Armored Reconnaissance Vehicle. Developed for export to Malaysia, the Panga has a redesigned hull and a one-man turret with 12.7-mm M2 HB machine gun. This model has the following features.

- Two-man crew.
- 5,840-kg combat weight.
- 22 meters length.
- 2.13 meters width.
- 2.34 meters height (to sight).
- Spare tire is on the right side.
- Additional external stowage.
- Another periscope on either side of the driver's hatch.
- Vapor-cycle air-cooling system.
- Hub winching equipment for self recovery.
- Improved vehicle lighting.
- Engine fire-extinguishing system.
- Dual circuit brakes.
- Electrically-operated tire pump.
- Trench crossing channels on the front.
- Flashing lights.
- Public address system.

(2) Fox/25-mm McDonnell Douglas Helicopters Chain Gun. This vehicle is the basic Fox equipped with a one-man, electric-driven turret. The turret is armed with a 25-mm M242 Chain Gun and coaxial 7.62-mm machine gun. The vehicle carries a minimum of 250 rounds of 25-mm and 1,500 rounds of 7.62-mm ammunition. Options include a stabilization system, escape hatches, limited slip differential, crew air cooling, and increased fuel capacity.

(3) Fox/MILAN. This is a basic Fox equipped with a one-man all-welded steel turret. A 7.62-mm McDonnell Douglas Helicopters Chain Gun is mounted in the forward part of the turret. The vehicle carries 2,600 rounds of ammunition. Mounted on the roof of the turret on the left side is a twin launcher for the Euromissile MILAN 2,000-meter ATGW with a minimum of six missiles carried in reserve. The MILAN launcher and its integral sight can be elevated and traversed independently of the turret. A bank of four electrically-operated smoke dischargers are mounted on each side of the forward part of the turret. The commander/gunner has one periscopic sight for aiming the machine gun and four vision blocks. Optional equipment includes escape hatches, limited slip differential, air cooling for the crew, 16 grenade launcher configuration, and increased fuel capacity.



(4) Fox/Scout. This is essentially the Fox/MILAN with the MILAN installation removed and the hole blanked. The conversion can be achieved in a matter of minutes using simple equipment. Armament consists of the 7.62-mm Chain Gun and four smoke dischargers.

b. Recognition Features. The Fox light armored car has the following recognition features.

- Two large wheels on each side.
- Large, flat undercut turret with a square bin in the rear.
- Long, thin gun in the turret.
- Hull larger than the Ferret hull.

c. Vehicle Characteristics. The Fox has an all-welded aluminum armor hull and turret which gives protection against medium and heavy machine gun fire and field artillery splinters. The driver sits in front and has an integral periscope/hatch cover that lifts and opens to the right. The centered turret holds the commander/loader on the left and gunner on the right.

They each have a rear-opening hatch cover. The commander has a periscopic binocular instrument on a rotating mount. The gunner has two periscopes and a periscopic binocular daylight sight linked to the main gun. There is a passive night sight mounted to the right of the main gun. A flash shutter operated from the gun firing circuit protects the image intensifier from gun muzzle flash. There is a wiper and washer and armored cowl kept over the sight.

In the rear of the turret are the radios. The engine and its auxiliaries, including gear boxes, are mounted as a powerpack that can be removed through the rear. The engine is a militarized Jaguar XK engine, and has a reduced compression ratio to use military gasoline. British Army vehicles have electronic ignition. Horizontal twin radiators are set across the top to the rear of the engine.

Without preparation, the Fox can ford one meter of water. A flotation screen may be erected in two minutes. The front of the flotation screen has transparent panels for viewing. All Foxes are equipped with a bilge pump. With the flotation screen erected, the Fox is propelled and steered across rivers by its wheels.

The Fox is air transportable. Three fox vehicles can be carried in a C-130 Hercules aircraft; two for parachute drop.

Standard equipment includes infrared/white light headlamps, commander's spotlight, external side stowage boxes, drinking-water tank, electric distribution box with a cooking vessel socket, and inter-vehicle starting socket. Optional equipment includes navigation aids, powered traverse, nuclear and chemical detection equipment, and a ZB 298 surveillance radar on the left side of the turret.

## Measurements

<u>Crew</u> , 3	Ground clearance, 0.3 meters
<u>Configuration</u> , 4 x 4	<u>Speed, ground</u> , 104 km/h
<u>Weight</u> , 6,120 kg	<u>Speed, water</u> , 5.23 km/h
<u>Hull length</u> , 4.166 meters	<u>Fuel capacity</u> , 145.5 liters
<u>Width</u> , 2.134 meters	<u>Range</u> , 434 km
<u>Height</u> , 2.2 meters	

d. Vehicle Capabilities. The Fox can

- cross a 1.22-meter trench (with channels).
- mount a 0.5-meter vertical step.
- climb a 58-percent grade.
- ford 1 meter.
- ford amphibiously with preparation.

e. Armament Characteristics. The armament characteristics are discussed in the subparagraphs below.

(1) Main Armament. A 30-mm RARDEN cannon fires a new armor-piercing round and other high-explosive rounds. It fires rapid single shots or bursts up to six rounds. Cartridge cases are automatically ejected outside the turret. Maximum effective range is 2,000 meters.

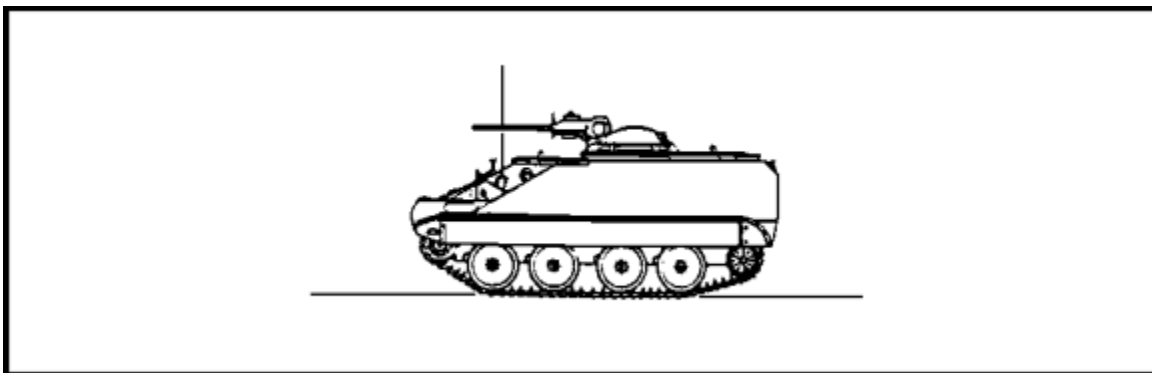
(2) Secondary Armament. Mounted coaxially to the main gun is a 7.62-mm machine gun. Four smoke dischargers are on each side of the front of the turret.

f. Countries Served. The Fox is in service in the following countries.

Iran	Nigeria
Kenya	Saudi Arabia
Malawi	United Kingdom

16. Lynx (or M113) Command and Reconnaissance Vehicle.

The Lynx shares many components with the M113A1 APC except it is much lower, has its engine in the rear, and has four road wheels. The vehicle has been purchased by Canada and the Netherlands. Canada calls the vehicle the Lynx, and the Dutch call it the M113 C&R. [Figure 2-16](#) shows a Lynx command and reconnaissance vehicle.



**Figure 2-16. Lynx Command and Reconnaissance Vehicle.**

a. Variants.

(1) Dutch Vehicle. The Dutch version has a slightly different layout from the Canadian Lynx. In the Dutch vehicle, the driver is seated at the front of the vehicle on the left, and has a single piece hatch cover that opens to the rear. The hatch has an integral infrared periscope mounted in its roof and four periscopes arranged around the forward part of the roof. The radio operator/gunner is seated to the right of the driver and has a hatch cover that opens to the rear. He also has four periscopes arranged around the forward part of the hatch cover. A 7.62-mm machine gun can be mounted forward of this hatch cover. There is an entry door in the right side of the hull to the rear of the radio operator/gunner.

When originally delivered, the Dutch vehicles were armed with a 12.7-mm machine gun, but the Dutch Army ordered 266 Oerlikon turrets armed with a 25-mm Oerlikon cannon for installation on the vehicles.

(2) Optional Armament Installations. The FMC Corp has offered the following options:

- Model 100-E cupola with a 7.62-mm M73 machine gun.
- Model 74 cupola with twin 7.62-mm M73 or twin .30-cal M37 machine guns.
- XM27 cupola (modified M26) with 20-mm Oerlikon cannon.
- M113 cupola with 12.7-mm, 7.62-mm, or 7.62-mm machine gun pintle-mounted.
- FMC Pedestal Mount with 7.62-mm, 12.7-mm, 20-mm, or 25-mm cannon that can be loaded, aimed, and fired from within the vehicle.
- ATGWs mounted in launcher boxes on the roof.
- 106-mm M40 recoilless rifle mounted on the roof.

- b. Recognition Features. The Lynx has the following recognition features.

- Fully tracked.
- Four road wheels with no return rollers.
- Drive sprockets in the front and idlers at the rear.
- Small rounded turret similar to a cupola is centered on the hull.

c. Vehicle Characteristics. An all-welded aluminum hull provides protection from small-arms fire, flash burns and shell fragments.

In the top front left is a rear-opening hatch cover for the driver. He has an integral infrared periscope and five other periscope blocks arranged around the front.

To the driver's right rear is the commander/gunner's M26 turret, which traverses 360 degrees and has eight vision blocks. Further to the rear left is the radio operator's rear-opening hatch cover and three periscopes.

A large hatch in the roof opens to the right for access to the rear engine. Also in the hull rear there is an access door opening to the left.

Standard equipment includes infrared driving lights and a fire extinguisher in the engine compartment. Optional equipment can be an NBC detection and alarm system, heater, windscreen, and a capstan drum for self-recovery.

The M113 is propelled through water by its tracks. Before going amphibious, a trim vane is erected in the front, and rectangular covers go around the air louvers on top.

### **Measurements**

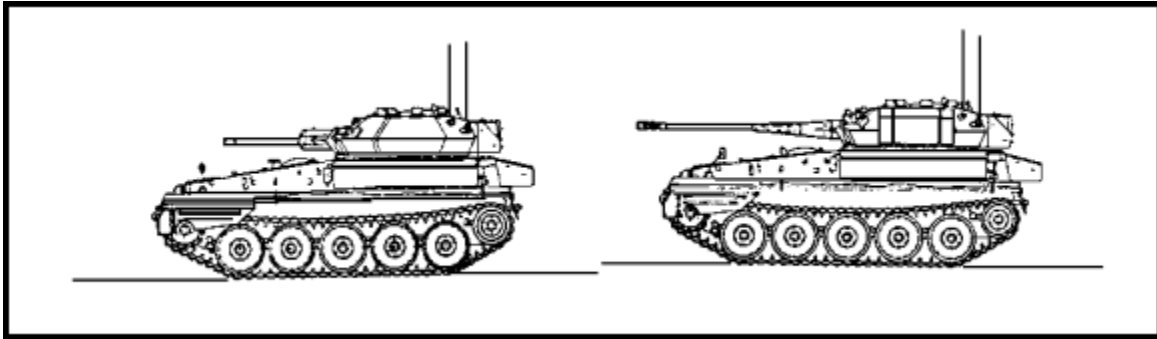
<u>Crew</u> , 3	<u>Track width</u> , 381mm
<u>Weight</u> , 8,775 kg	<u>Track length on ground</u> , 2.39 meters
<u>Length</u> , 4.597 meters	<u>Speed, road</u> , 70.8 km/h
<u>Width</u> , 2.4 meters	<u>Speed, water</u> , 5.6 km/h
<u>Height</u> , 1.651 meters (hull)	<u>Fuel capacity</u> , 303 liters
<u>Ground clearance</u> , 0.41 meters	<u>Range</u> , 523 km
<u>Track</u> , 1.885 meters	

- d. Vehicle Capabilities. The Lynx can

- cross a 1.524-meter trench.
- mount a 0.609-meter vertical step.
- climb a 60-percent grade.
- climb a 40-percent side slope.
- ford amphibiously.

- e. Armament Characteristics. An M26 manual-traverse turret has a 12.7-mm machine gun that can be aimed and fired from within the vehicle. At the rear at the radio operator's station is a 7.62-mm machine gun. Three smoke dischargers are on either side of the hull in the front.
- f. Countries Served. Users are Canada and the Netherlands.

17. Scorpion and Scimitar Armored Reconnaissance Vehicle (U.K.) ([Figure 2-17](#)).



**Figure 2-17. Scorpion.**

The Scorpion is a light tank. The Scimitar is a reconnaissance vehicle. They were developed at the same time as the Fox wheeled vehicle. They have the same Jaguar engine as the Fox.

During the 1982 Falklands campaign, the British Army deployed two Scorpions, four Scimitars, and one Samson armored recovery vehicle. A government report stated: "The ground forces were heavily dependent on helicopters and tracked vehicles for mobility. The tracked reconnaissance vehicles, Scorpion and Scimitar, performed very well in boggy conditions, covering an average of 350 miles each. One vehicle withstood a shell which landed 1.5 meters away. Another ran over a mine which severely damaged the vehicle but left the crew unharmed."

- a. Variants. The following subparagraphs provide information on the variants of the Scorpion and Scimitar.

- (1) Belgian Scorpion and Scimitar. The Belgian Army's Scorpions and Scimitars underwent two major repair and maintenance programs. The first program included modifications to rectify cracks in the armor. The second program was combined with a mid-life general overhaul and improved safety for the crew, better operational capability, improved reliability, and easier maintenance.
- (2) Irish Scorpions. These Scorpions have a 12.7-mm machine gun on an anti-aircraft mount installed on the turret roof.
- (3) New Zealand Scorpions. The New Zealand Scorpions include an electronic ignition system, a Dunlop power traverse system, American radios, and no NBC protection or image intensification night sights.
- (4) Omani Scorpions. The Omani Scorpions had many modifications. These are listed below.

- Installation of a central warning system.
- Larger rubber mud flaps at rear.
- Fiberglass track shrouds replaced by rubber shrouds.
- Driver's mine plate increased to 20 mm.
- Larger rear hull stowage bin.
- Left tool bin replaced by larger bin with facility to stow two extra jerry cans.
- Additional stowage bin on right side of hull.
- No NBC pack. This allows for an additional five rounds of 76-mm ammunition and three boxes of machine gun ammunition in its place.
- No. 25 reel and bracket installed.
- Turret fume extractor.
- Helio MG pintle fitted adjacent to commander's hatch aperture.
- Stowage bins either side of the turret.
- Two-color camouflage paint.
- Mounting points to enable Clark-type radio mast to be erected at the front of the vehicle.
- Vickers Instruments L20 laser sights to complement the L22 TLS fitted in the Omani Chieftain tanks.

(5) Scorpion 90. This export model can deal with all types of targets and can inflict severe damage on main battle tanks. The Scorpion with a 90-mm Cockerill Mk III gun was first produced with the American Cadillac Gage power traverse and elevation system now superseded by Marconi Command and Control Systems equipment. Malaysia has 26 Scorpion 90s with the Perkins diesel engine and German smoke/fragmentation grenade dischargers.

Nigeria has 33 Scorpion 90s with the Belgian OIP-5 fire-control system. In 1988, Venezuela reportedly ordered 84 Scorpion 90s.

(6) Scorpion Improvement Program. Alvis produced Scorpions with its Jaguar XK gasoline engine replaced by a Perkins turbo-charged six-cylinder diesel model T6-3544. It develops 200 horsepower at 2,700 rpm. The weight increased from 8,073 kg to 8,260 kg. The vehicle's range increased from over 640 km to over 840 km. Acceleration to 48.3 km/h improved from 18.5 seconds to 16 seconds.

Laser rangefinders for the Scorpion come in various configurations for sights and fittings. A Far Eastern customer, believed to be Thailand, ordered 160 Vickers L20 sights. Omani has this sight fitted with a Ferranti laser rangefinder. The United Arab Emirates has a Barr and Stroud Tank Laser Sight.

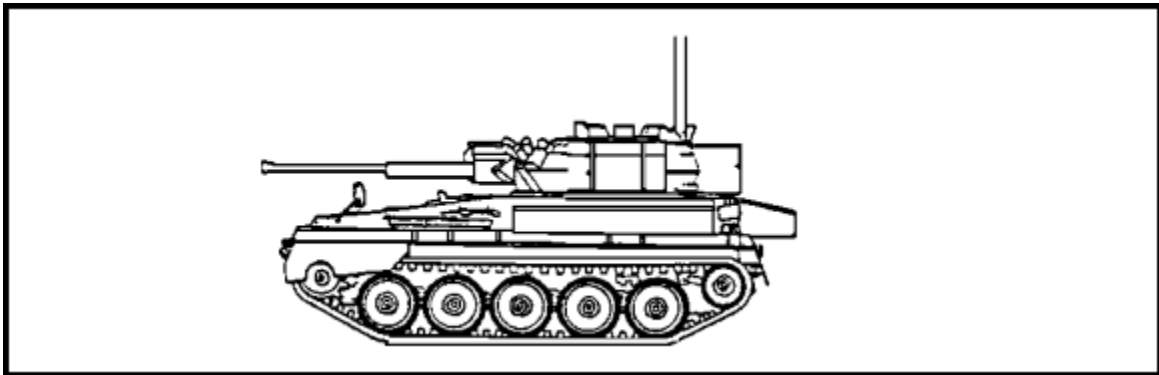
A package of improvements for export vehicles includes:

- Avimo NV53 day/night commander's sight.
- Avimo NVL53 day/night gunner's sight with integral laser rangefinder.
- Power traverse and elevation drives.

- External 7.62-mm machine gun mount which can be used by the commander or the gunner.
- New fume extraction system.
- Improved transmission.
- Improved suspension and enhanced cross-country mobility.
- Fire suppression system.

(7) Scorpion Dieselization Package. This variant uses a proven diesel engine design. It allows for system compatibility and offers all of the financial, logistics, operational, and technical advantages associated with diesel powered vehicles. Diesel conversion packages can be undertaken in-country.

(8) Scimitar Reconnaissance Vehicle (FV107) ([Figure 2-18](#)). The Scimitar has the same hull and turret as the Scorpion but is armed with a 30-mm RARDEN cannon instead of the 76-mm gun. It fires 30-mm Hispano Suiza Oerlikon ammunition as well as many British rounds. It also fires a new APDS-T round. The gun fires in rapid single shots or bursts up to six rounds. Empty cartridge cases automatically eject outside the turret. Coaxially to the left of the main gun is a 7.62-mm machine gun. Four smoke dischargers are on each side of the turret front.



**Figure 2-18. Scimitar Reconnaissance Vehicle.**

b. Recognition Features. The Scorpion and Scimitar have the following recognition features.

- Five road wheels on each side.
- Long, front slope to hull.
- Short 76-mm gun barrel or long, slender 30-mm gun.
- Possible prominent, upturned exhaust on the right side.
- Amphibious and air transportable.

c. Vehicle Characteristics. The hull is made of all-welded aluminum armor and provides the crew with protection against attack over its frontal area from 14.5-mm projectiles and against 7.62-mm armor piercing rounds over the remainder of the vehicle. The aluminum armor is also particularly effective against shell splinters. There are three compartments: drivers in the front left, engine in the front right, and fighting in the rear. The driver's hatch cover opens to the left. In front is a single wide-angle periscope.

The all-welded aluminum turret holds the commander on the left and gunner on the right, each with a rear-opening hatch cover. The commander has seven periscopes and a rotating roof-mounted sight in front of his hatch. The gunner has two periscopes and a roof-mounted sight. To the right of the main gun is a passive night sight. The image intensifier tube has a flash shutter. The window has a wiper and washer and armored cover. In the turret bustle are radios. At the rear of the hull is a light metal stowage box. Another stowage box is on the left side of the hull of British Army Scorpions.

A Lockheed C-130 can carry two Scorpions. An NBC system is at the rear of British Army Scorpions. Optional equipment includes an NBC detector kit, vehicle navigation system, and an air-conditioning system which has been fitted to United Arab Emirates vehicles.

The Scorpion can ford a one-meter depth without preparation. A flotation screen is carried collapsed around the top of the hull. This can be erected by the crew in five minutes. Then the vehicle is propelled and steered across water by its tracks at a speed of 6.5 km/h. When fitted with a propeller kit, the Scorpion goes 9.5 km/h. Some key specifications are:

<u>Model</u>	<u>Scorpion</u>	<u>Scorpion 90</u>	<u>Scimitar</u>
<u>Designation</u>	FV101	N/A	FV107
<u>Crew</u>	3	3	3
<u>Weight</u>	8,073 kg	8,723 kg	7,800 kg
<u>Length hull</u>	4.79m	4.79m	4.79m
<u>Width</u>	2.235m	2.226m	2.242m
<u>Height</u>	2.102m	2.102m	2.096m
<u>Track</u>	1.708m	1.708m	1.798m
<u>Track width</u>	432mm	432mm	432mm
<u>Speed</u>	80.5 km/h	72.5 km/h	80.5 km/h
<u>Fuel Capacity</u>	423 liters	391 liters	423 liters
<u>Range</u>	644 km	756 km	644 km
<u>Main armament</u>	76mm	90mm	30mm

d. Vehicle Capabilities. The Scorpion and the Scimitar can

- cross a 2.057-meter trench.
- mount a 0.5-meter vertical step.
- climb a 60-percent grade.
- ford 1.067 meters without preparation.
- ford amphibiously with preparation.



e. Armament Characteristics. The Scorpion is armed with a 76-mm L23 gun. It has a vertical sliding breech and is loaded with fixed ammunition. It recoils approximately 280 mm. The weapon fires various high-explosive, smoke, canister, and illuminating rounds.

Mounted coaxially to the main gun is a 7.62-mm machine gun that can be used as a ranging machine gun. A four-barrelled smoke discharger is on each side of the turret.

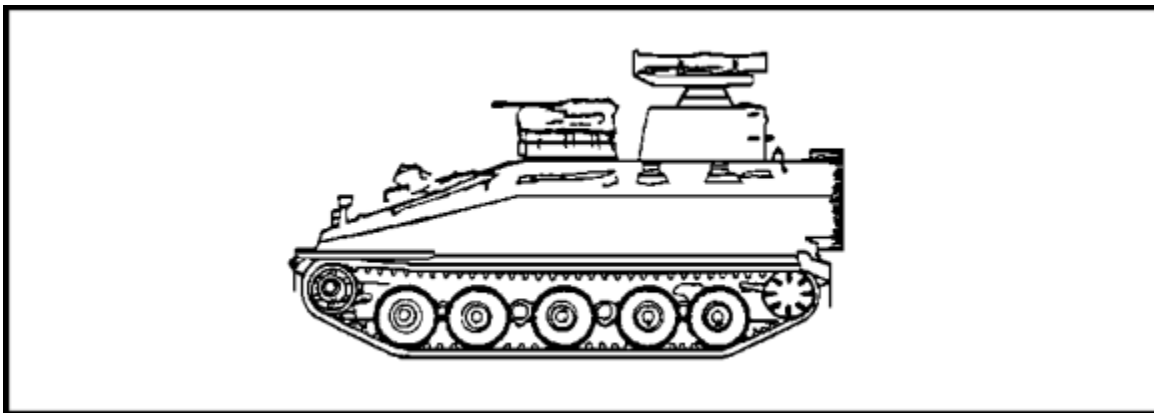
The Scimitar armament is discussed above in the subparagraph on the Scimitar.

f. Countries Served. This reconnaissance vehicle is in service with:

Belgium	Kuwait	Tanzania
Brunei	Malaysia	Thailand
Abu Dhabi	New Zealand	Togo
Ghana	Nigeria	United Arab
Honduras	Oman	Emirates
Iran	Philippines	United Kingdom
Ireland	Spain	

18. Spartan Armored Personnel Carrier (U.K.) ([Figure 2-19](#)).

The Spartan is used for various roles including missile resupply for the Striker and carrying Royal Artillery Javelin Manportable SAM teams or Royal Engineer assault teams. The Spartan has a similar hull to the Striker. The Spartan carries four infantryman, plus the driver, vehicle commander/gunner and section commander/gunner.



**Figure 2-19. Spartan APC.**

a. Variants. There are several proposals and trials models for variants of the Spartan APC. These are discussed in the following subparagraphs.

(1) Spartan Anti-Aircraft Variant. One proposal is to fit the Spartan with the French EST TA 20 turret armed with twin 20-mm cannon.

(2) Spartan with Hughes TOW ATGW System. There is one proposal to equip the Spartan with a Hughes TOW launcher on the roof and carry nine missiles in the rear of the vehicle. The vehicle would also carry a tripod to enable the missile to be used on the ground.

(3) Spartan with Euromissile HOT ATGW System. For trails purposes a Spartan APC has been equipped with a Euromissile HOT HCT turret with four HOT 4,000-meter ATGWs in the ready-to-launch position.

(4) Spartan with Euromissile MILAN ATGW System. This system has been ordered by the British Army. The vehicle is a Spartan APC fitted with a Euromissile MILAN MCT compact turret mounted over the roof. It has two missiles in the ready-to-launch position and 11 missiles carried internally. This system can be installed during manufacture, or it can be retrofitted to existing vehicles without major modification.

b. Recognition Features. The Spartan APC has the following recognition features.

- Fully tracked.
- Five road wheels.
- Long front slope.
- Uses Scorpion basic chassis.

c. Vehicle Characteristics. The driver sits at the front on the left with a forward-opening hatch cover. He has a single wide-angle periscope. Behind the driver is the vehicle commander/gunner with eight periscopes in a cupola with one large monocular sight. Mounted to the right of the cupola is a 7.62-mm machine gun that can be aimed and fired from inside the vehicle. The cupola's hatch cover opens to the left. To the right is a right-opening hatch cover for the commander/radio operator who has three periscopes.

The personnel compartment has a single rear door hinged on the right side. It has an integral vision block. On top of the troop compartment are two roof hatches opening to either side. Two periscopes are on the left side; one on the right. There is no provision for troops to fire their weapons from inside. Three infantrymen sit on the left side. A fourth sits to the rear of the commander, facing the rear. A ZB 298 ground surveillance radar may be mounted on the roof.

The Spartan has many of the same characteristics as the Scorpion/Scimitar described in an entry above. The Spartan has the following specifications:

#### **Measurements**

<u>Crew</u> , 3	<u>Track</u> , 1.708 meters
<u>Passengers</u> , 4	<u>Track width</u> , 432mm
<u>Weight</u> , 8,172 kg	<u>Speed</u> , 80.5 km/h
<u>Length</u> , 5.125 meters	<u>Fuel capacity</u> , 386 liters
<u>Width</u> , 2.242 meters	<u>Range</u> , 483 km

Height, 2.26 meters

Ground clearance, 0.356 meters

d. Vehicle Capabilities. The Spartan APC can

- cross a 2.057-meter trench.
- mount 0.5-meter vertical step.
- climb a 60-percent grade.
- ford 1.067 meters without preparation.
- ford amphibiously with preparation.

e. Armament Characteristics. The Spartan has a 7.62-mm machine gun with 3,000 rounds of ammunition. It also carries 4 smoke dischargers on each side.

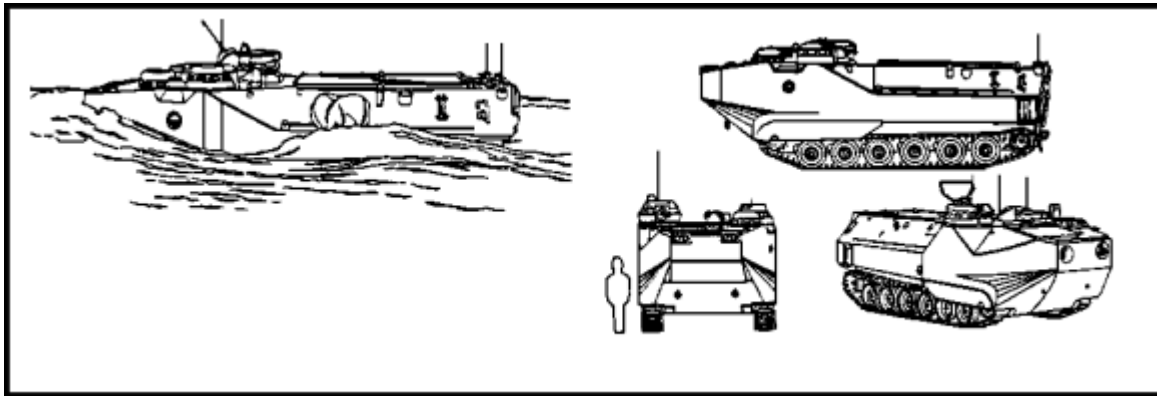
# Practice Exercise

## Lesson 2

**Instructions** The following items will test your understanding of the material covered in this lesson. There is only one correct answer for each item. When you have completed the exercise, check your answers with the answer key that follows. If you answer any item incorrectly, review that part of the lesson which contains the portion involved.

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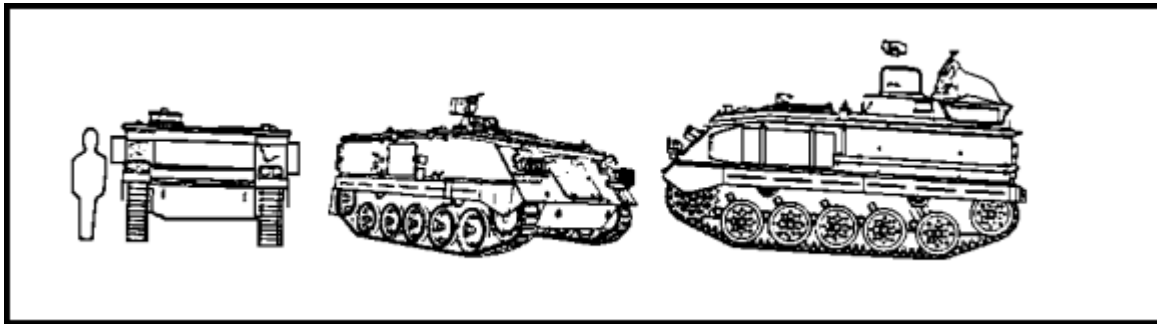
General Situation: You are an infantry officer on a NATO sponsored FTX in North Africa. It is important that you recognize the various capabilities and recognition features of light armored vehicles used by friendly forces. Use this general situation to answer the questions in this practice exercise.



**Figure 2-20.**

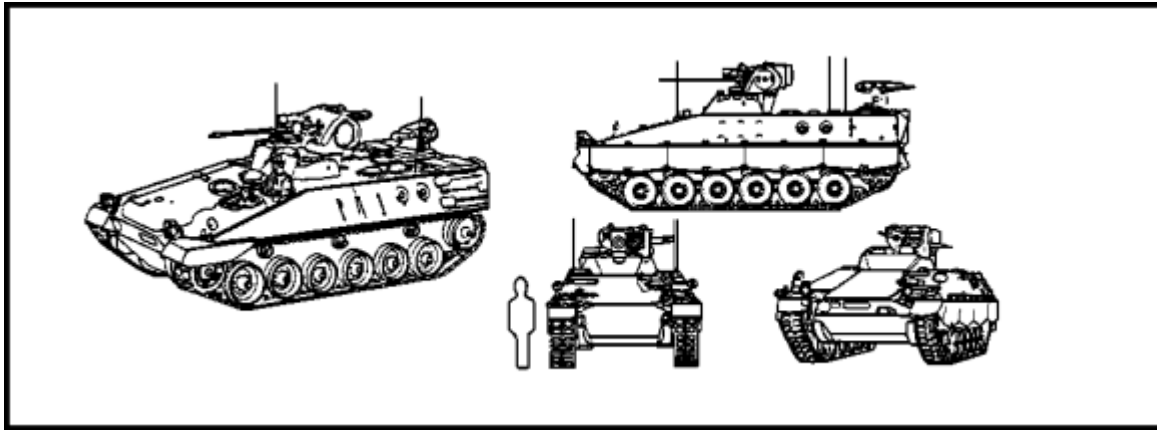
1. While observing water traffic at a river, you see three vehicles like the one shown in Figure 2-20 approach the gently sloping river bank. Without preparation, the vehicles enter the river and ford amphibiously. You identify the vehicles as
  - ☐ A. LVTP7 amphibious assault vehicles.
  - ☐ B. Commando V-150s.
  - ☐ C. AMX 10P infantry combat vehicles.
  - ☐ D. LAV 25 light armored vehicles.

2. The vehicles you identified in Figure 2-20 are in service with which of the following countries.
- A. Australia.
  - B. Austria.
  - C. Germany.
  - D. Italy.



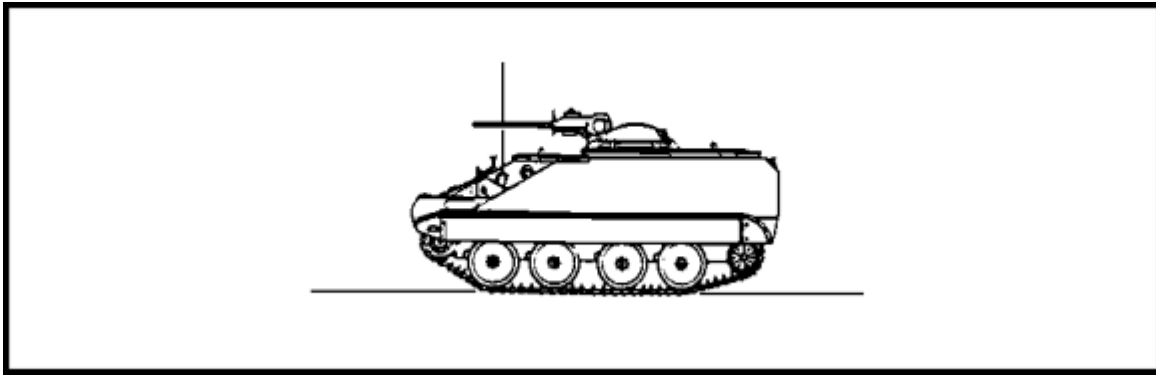
**Figure 2-21.**

3. While observing the same river, you see two vehicles like the one shown in Figure 2-21. These vehicles approach the river, stop, and erect a flotation screen before entering the river and fording amphibiously. You identify these vehicles as
- A. LAV 25s.
  - B. Marder ICVs.
  - C. FV432 APCs.
  - D. LVTP5A1s.
4. The vehicle shown in Figure 2-21 has a 7.62-mm GPMG or a 7.62-mm Bren LMG. When it has the GPMG, how many rounds of ammunition does it carry?
- A. 1,200.
  - B. 1,400.
  - C. 1,600.
  - D. 2,000.



**Figure 2-22.**

5. While observing operations, you observe a number of tracked vehicles like one in Figure 2-22 dismount infantry troops through a ramp at the rear. These vehicles are
  - A. Commando V300s.
  - B. Marder ICVs.
  - C. Renault VAB APCs.
  - D. M2 Bradleys.
6. The vehicle in Figure 2-22 has a 20-mm cannon. A feature of this Rheinmetall MK 20 Rh 202 cannon is that it has
  - A. three different belts feeding it.
  - B. a fully automatic target acquisition system.
  - C. a coaxially mounted 40-mm grenade launcher.
  - D. an extremely slow rate of fire for 20-mm gun.



**Figure 2-23.**

7. You are planning an exercise using various allied units. The vehicle shown in Figure 2-23 has which of the following characteristics or capabilities?
  - A. Top speed of 90 km/h.
  - B. Can ford amphibiously.
  - C. Carries 12 passengers.
  - D. Can mount a .732-meter vertical step.
8. You identify the vehicle in Figure 2-23 as a
  - A. Marder.
  - B. Ferret.
  - C. Scorpion.
  - D. Lynx.